Edition 1.0
Status: 2011-07 / English

Pushing Performance

HARTING Ha-VIS Management Software 2.0 User manual

For Ha-VIS FTS 3000

People | Power | Partnership

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1st Edition 2011, revised 07/11

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1. Introduction

HARTING's FTS 3000 family of managed Ethernet Switches are suitable for creating Ethernet and Fast Ethernet networks with distributed star or nodal points in industrial environments where a high level of operational reliability is required.

Equipped with up to ten ports, the Ethernet Switch are suitable for installation in the electrical cabinet. Your HARTING FTS Switch comes with an embedded web server and a user-friendly web interface that makes switch management intuitive and efficient. Configuration and maintenance are also possible using SNMP versions 1, 2 and 3.

Additional to standard managed Ethernet Switches the FTS devices offer the advantages of the Fast Track Switching Technology which enables deterministic data transfer for automation frames as well as a high priority data transfer for selected types of frames.

This software guide for the FTS family of switches contains information required to operate the switch management software. This information is applicable for all switches in the FTS 3000 series. The examples and screenshots in this manual are taken from the FTS 3100-A; the number of ports and the information shown in your software may vary depending on the model of switch you use.

This software guide has the following structure:

Chapters 1 to 3	Notes on safety and general information about this manual.
Chapters 4 and 5	Basic information about the software, user rights, installation and logging in.
Chapters 6 to 15	Detailed information about the individual areas and windows of the software and all the settings that can be made.
Chapters 16	Specialized information about the Service Mode.
Appendix A	Glossary of terms and abbreviations.
Appendix B	Instructions for older firmware versions.

2. Safety Guidelines and Approved Usage

In order to function properly, the switch management software must be correctly installed and appropriately operated. The switch management software should be used only in conjunction with a HARTING Ethernet Switch.

Observe the following general safety instructions before installing and using the switch management software:

- Ensure correct polarity and voltage when connecting the power supply to the Ethernet Switch.
- Use only shielded cable for data lines.
- Use only cables that comply with the corresponding standards for Ethernet connections.
- Cover all unused data ports with the appropriate cover. Covers must be ordered separately.

ATTENTION

The Ethernet Switch should be operated only when it is properly and securely mounted.

CAUTION

Only authorized and qualified personnel are permitted to work on this device!
Improper work or repairs can damage the integrated protective safety functions and the performance of this device. This can cause the device to malfunction, be a source of personal danger, or cause damage to connected machines or connected systems.

3. General Notes about this Manual

3.1 Explanation of the symbols

The following symbols are used in this software guide:

CAUTION

This symbol describes warning notes that indicate a low-level source of danger. If not avoided, light or minor injuries or damage to property may result.

ATTENTION

This word describes warning notes that indicate a low-level source of danger. If not avoided, damage to property may result.

Note

This symbol describes general notes that provide important information concerning one or more operating steps. Such notes may also provide references to further information supplied within this manual.

3.2 Typographical conventions

This manual uses the following typographical conventions to describe the software interface:

Italics	text in italic font refers to an entered value, a selection from a drop-down list (such as ***Enable***), a reference to a section of the software menu (such as ***General Settings***) or drop-down list choices.
Bold	text in bold font refers to the name of a row or column found within the software interface, or to the name of a field where data is displayed or specified.
bold blue	internal links, links to web pages, or other links

3.3 Additional information

Mounting instructions for this switch can be found in the Ethernet Switch ***Installation Notes*** included in the delivery. The ***Installation Notes*** also provide valuable hardware-specific information such as the pin-out assignments, LED displays, technical specifications, and power supply requirements.

The latest versions of the switch firmware and the manual can be downloaded from the Internet at **http://www.harting.com**

4. Basic Operation

Be sure to mount the switch and verify that it is secure before starting any software configuration. Refer to the ***Installation Notes*** for mounting instructions.

This Ethernet Switch must first be connected to your local area network before it can be configured. The switch management software and embedded web server are pre-installed on the switch.

You will require a networked computer with an HTTP web browser or an SNMP Tool to configure the switch management software. A TFTP server program should also be installed on this PC in the event that you need to update the switch firmware or to export or import a configuration file.

4.1 Switch access and configuration

The Ha-VIS FTS Ethernet Switches offer a variety of software functionalities to configurate and setting up the network. For configuration purpose, the switch can be accessed in several ways.

The easiest way is to use a standard web browser to configurate the switch via a graphical HTTP based user interface. To connect to the switch, the user must log in to the switch using the web browser (following the instructions below). The user must log out before exiting the browser, because the parallel connections to the switch (web sessions) are limited to two and the timeout for each session is 2 minutes. Once you have logged out, you can close the browser window in which the web interface was running.

The second way is to access the switch via an SNMP software. The Ha-VIS FTS Ethernet Switches are supporting the standard MIBII and can be easily integrated to an existing LAN infrastructure and management suit. Some functionalities are product and HARTING specific and therefore are not included in the MIBII. To get also access to this functionalities using SNMP, you have to copy the HARTING MIB file to your MIB repository of your SNMP software.

An other way is to access the switch via PROFINET (see **chapter 18 Configuration with Automation Software Tool**).

4.2 Web access

Proceed as follows to turn on the switch and login:

1. Connect the switch to your network or to a service computer using an Ethernet patch cable. You may select any free port on the switch.
2. Connect the switch to the power supply (refer to the ***Installation Notes***). The switch will take about forty seconds to boot up.
3. Turn on a computer connected to the same network as the switch. If you are starting with a brand new switch, you should initially configure your host PC so that it is on the same network segment as the switch (the switch has a factory default IP of ***192.168.0.126***, and a subnet mask of ***255.255.255.0***).
4. Launch your web browser and open a window.
5. Enter the network address of the switch into the browser. See the ***Installation Notes*** / ***Quick Start Guide*** for more information about altering your computer's network settings. The login screen of the software will be displayed after your browser has successfully established an HTTP connection to the switch.

6. Enter your username and password. Normally, the ***admin*** account is used for switch administration. A ***guest*** account exists for viewing the configuration only. The default ***admin*** password is ***harting***. You should change this password as soon as possible.

4.2.1 Changing the switch IP address

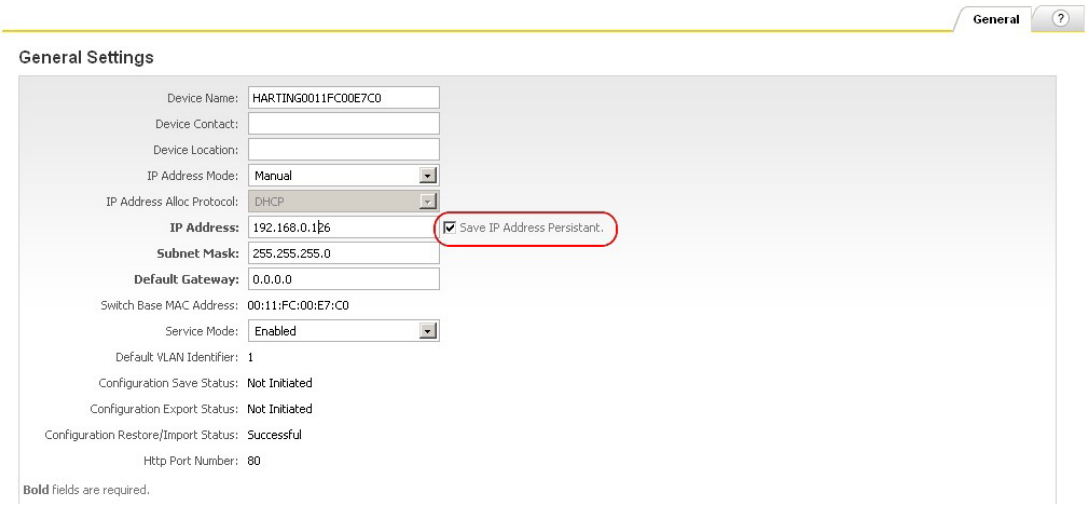


Figure 1 Changing and saving the IP address

Initially, you may need to assign a new IP address to the switch. Be sure to choose a unique IP address from your LAN's address space. Follow the steps below to change the IP address:

1. Using the clickable menu tree on the left of the screen, go to the **System Settings** → **General Settings** section.
2. Specify the new IP address in the ***IP Address*** field.
3. Check the box next to ***Save IP Address Persistent***.
4. You will no longer be able to connect to the switch using the old IP address. Using your web browser, you will be connected automatically to the switch using the new IP address.

4.2.2 Logging out

To log out from the software at any time, simply click the *Logout* button in the top right-hand task bar. The login screen is then once again displayed.

Note

It is important to use the logout button when leaving the switch web interface. The number of sessions are limited to 2 and the duration of one session is 10 minutes.

4.3 SNMP configuration

To get access to the switch using SNMP, an SNMP based software tool is needed. SNMP (Simple Network Management Protocol) is the most widely-used network management protocol on TCP/IP-based networks. SNMP provides an easy mechanism for managing a network using a simple Command-Response protocol defined between the Manager and the managed entities. The management is performed through MIBs (Management Information Base)

supported by the managed entities. The MIBs contain configuration elements, which can be either Viewed (GET) or Modified (SET) by the Managers.

To access the switch, you need the following information of the switch:

- The switch IP address (default: ***192.168.0.126***)
- The community password to read values from the switch (default: ***public***)
- The community password to read/write values from/to the switch (default: ***private***)

5. Introduction to the Web Browser Interface

The web interface offers a simple way to manage the software functionalities of the Ha-Vis mCon Ethernet Switches. The websites will be refreshed automatically in short intervals.

One of the following web browser versions should be used for switch configuration:

- Microsoft Internet Explorer version 7 or later,
- Firefox version 2 or later,

5.1 The menus

The structure of the software interface has been kept simple. After logging in to the mCon homepage, you will see a main navigation menu tree on the left side and an active window in the middle right side of the browser window. Using the menu tree, you can access all of the settings and statistics available on the switch. On the top you find the options for refreshing the window or to logout form the web interface. The menu bar at the bottom shows an overview of general switch parameters and also the status of the configuration storage.

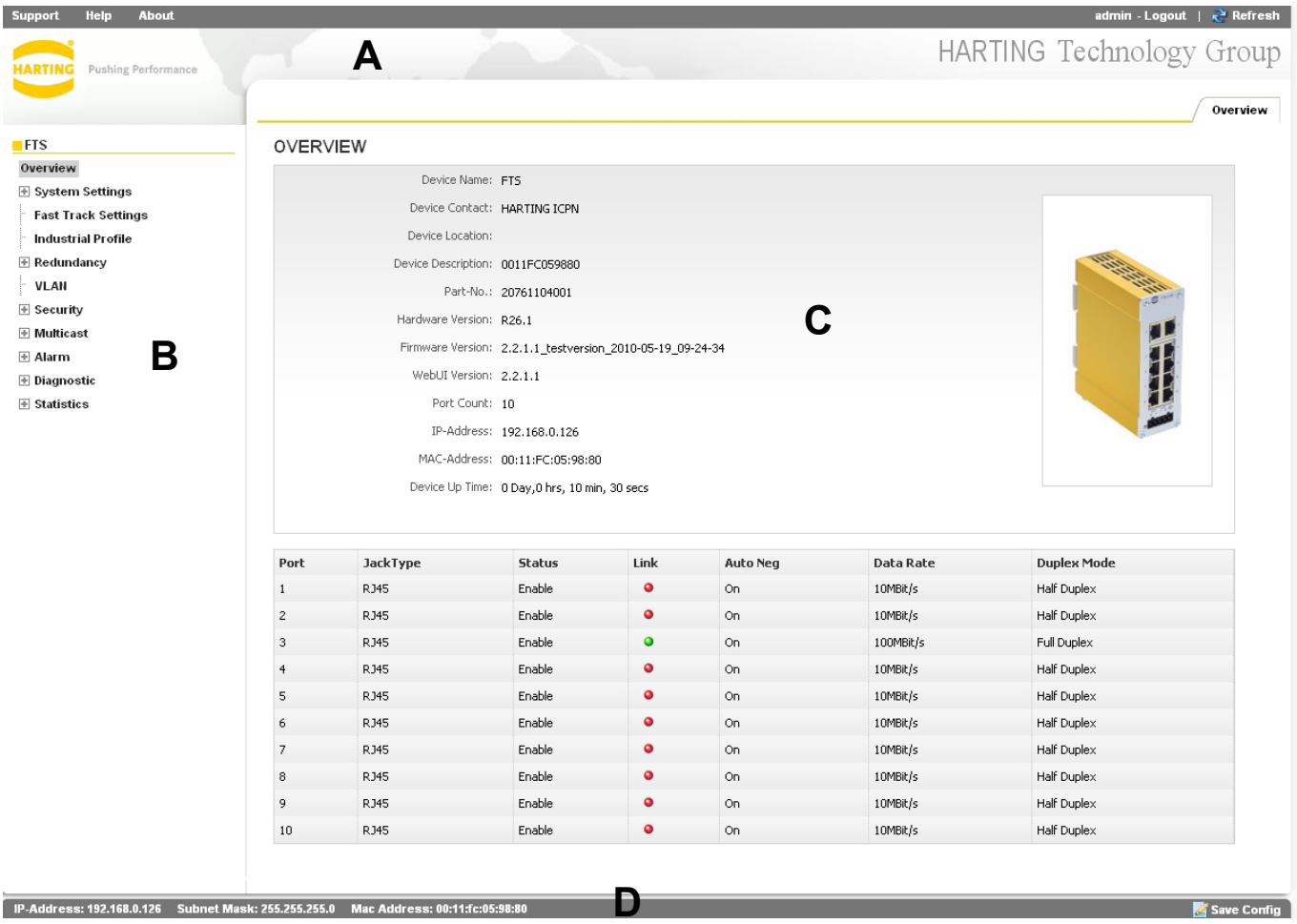

Support
Help
About
admin - Logout
Refresh
HARTING
Pushing Performance
A
HARTING Technology Group
Overview
FTS
Overview
System Settings
Fast Track Settings
Industrial Profile
Redundancy
VLAN
Security
Multicast
Alarm
Diagnostic
Statistics
B
OVERVIEW
Device Name: FTS
Device Contact: HARTING ICPN
Device Location:
Device Description: 0011FC059880
Part-No.: 20761104001
Hardware Version: R26.1
Firmware Version: 2.2.1.1_testversion_2010-05-19_09-24-34
WebUI Version: 2.2.1.1
Port Count: 10
IP-Address: 192.168.0.126
MAC-Address: 00:11:FC:05:98:80
Device Up Time: 0 Day,0 hrs, 10 min, 30 secs
C
Port | JackType | Status | Link | Auto Neg | Data Rate | Duplex Mode
1 | RJ45 | Enable | On | 10MBit/s | Half Duplex
2 | RJ45 | Enable | On | 10MBit/s | Half Duplex
3 | RJ45 | Enable | On | 100MBit/s | Full Duplex
4 | RJ45 | Enable | On | 10MBit/s | Half Duplex
5 | RJ45 | Enable | On | 10MBit/s | Half Duplex
6 | RJ45 | Enable | On | 10MBit/s | Half Duplex
7 | RJ45 | Enable | On | 10MBit/s | Half Duplex
8 | RJ45 | Enable | On | 10MBit/s | Half Duplex
9 | RJ45 | Enable | On | 10MBit/s | Half Duplex
10 | RJ45 | Enable | On | 10MBit/s | Half Duplex
IP-Address: 192.168.0.126
Subnet Mask: 255.255.255.0
Mac Address: 00:11:fc:05:98:80
D
Save Config

Figure 2 Screen structure

A The top task bar
B The menu tree
C The active window
D The bottom task bar

5.1.1 The top task bar

The task bar at the top of the window contains links to ***Support***, ***About***, ***Refresh*** and ***Logout***. As long as you are logged in to the switch, this bar remains on the top of the browser window. It is necessary to use the logout button before closing the browser, to be sure that the web session is terminated correctly. A manual refresh of the current website is possible by pressing the ***Refresh*** button. This might be helpful to update the status during a file transfer via http.

5.1.2 The menu tree

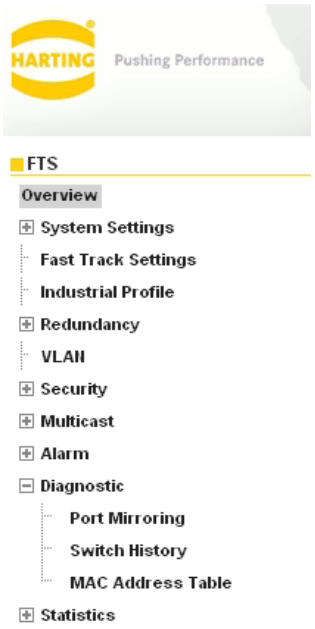


*Figure 3 The menu tree, with the **Diagnostic** section expanded*

A clickable, two-level menu located on the left of the browser window is used to navigate through the switch functionality. You can view or change switch settings and statistics by clicking on any of the various second-level menu choices.

5.1.3 The active window

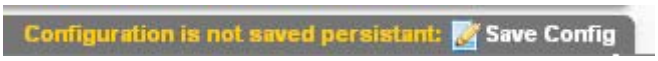
Most of the screen is taken up with the active window, in which settings and statistics for the switch are displayed and configured. The active window consists of several tabbed sub-windows. The right-most tabbed section is marked with a question mark and contains helpful explanations for the corresponding settings.

5.1.4. The bottom task bar

On the left side the IP Address, the Subnetmask, the MAC Address and the firmware version of the switch is displayed. On the right site, the current configuration storage status is shown. All configuration changes done during the web session are stored to the volatile memory by pressing the apply button. These modifications are not saved, if the ***Save Config*** button has not been pressed and the switch is powered down in this state.

5.2 Saving changes with the Save Configuration button

Whenever you modify a setting (by checking a box or specifying a value, etc.), you must click on the ***Apply*** button located at the bottom of the active window to confirm the change. Note that the ***Apply*** function normally saves the changes only temporarily to RAM. When one of the windows is opened, the ***Apply*** button is initially highlighted grey. When settings or alterations are made in the window the ***Apply*** button is activated. It now appears in a bold font to remind you that settings have been made or altered and that these must be confirmed by clicking the ***Apply*** button. After this is done, the ***SAVE CONFIGURATION*** button in the bottom bar will be shown with an additional Yellow text. Click here to save your changes permanently in flash memory to make the configuration also existent after a power down or a software reboot.



Assume configuration changes and saving them permanent:

- The software maintains any configuration changes in volatile memory after pressing the ***Apply*** button
- The administrator must explicitly trigger the save operation (bottom bar after changing parameters
- When triggered, the software saves the full configuration into a file inside the flash memory
- Any old contents in the file are over-written
- When the switch is restarted, the software starts with the last configuration saved to the flash

Note

The ***Apply*** button only saves your changes temporarily until the next reboot. With this you have the possibility to check a proper working configuration before making it persistent. You must click on the subsequent ***SAVE CONFIGURATION*** button in order to save the changes persistently. See also chapter **SD Memory Card**.

5.3 Invalid entries

If you specify an invalid entry (for example, an out-of-range timer value or improperly formatted IP address), a red exclamation mark is displayed next to the error field to notify the user of the error.

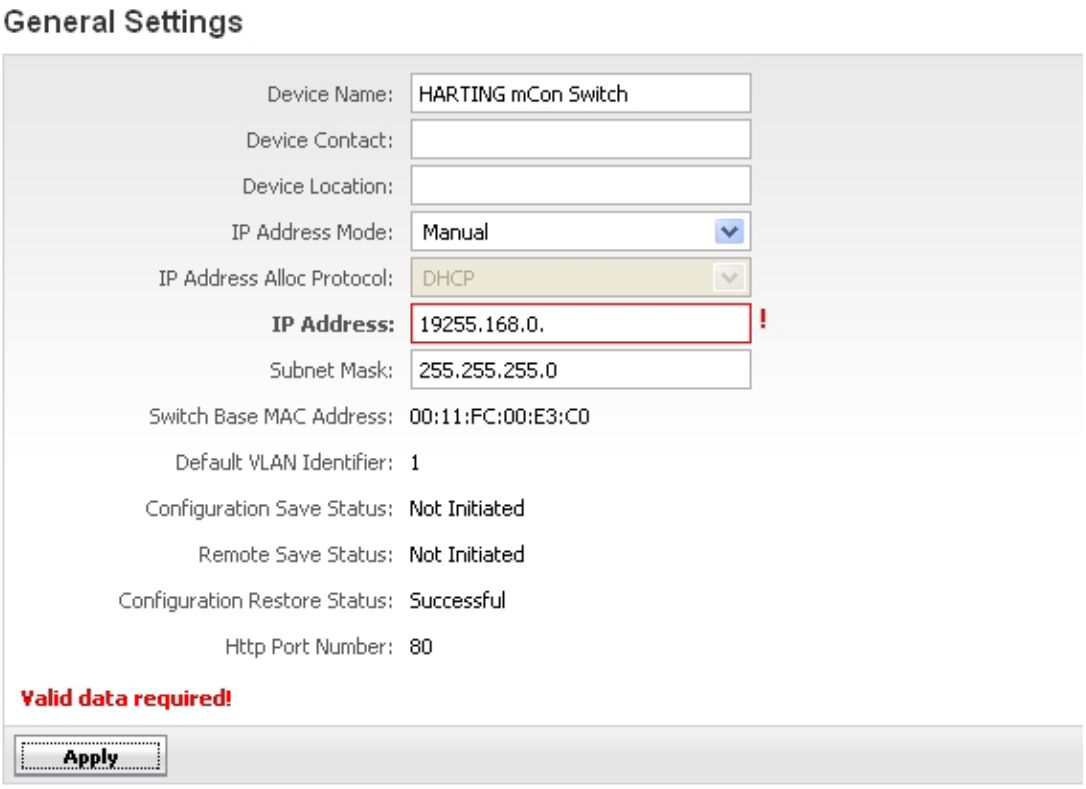


Figure 4 *Invalid entry: the exclamation point indicates an improperly formatted IP address*

5.4 User rights

There are three defined user modes for accessing the Ethernet Switch web-based software:

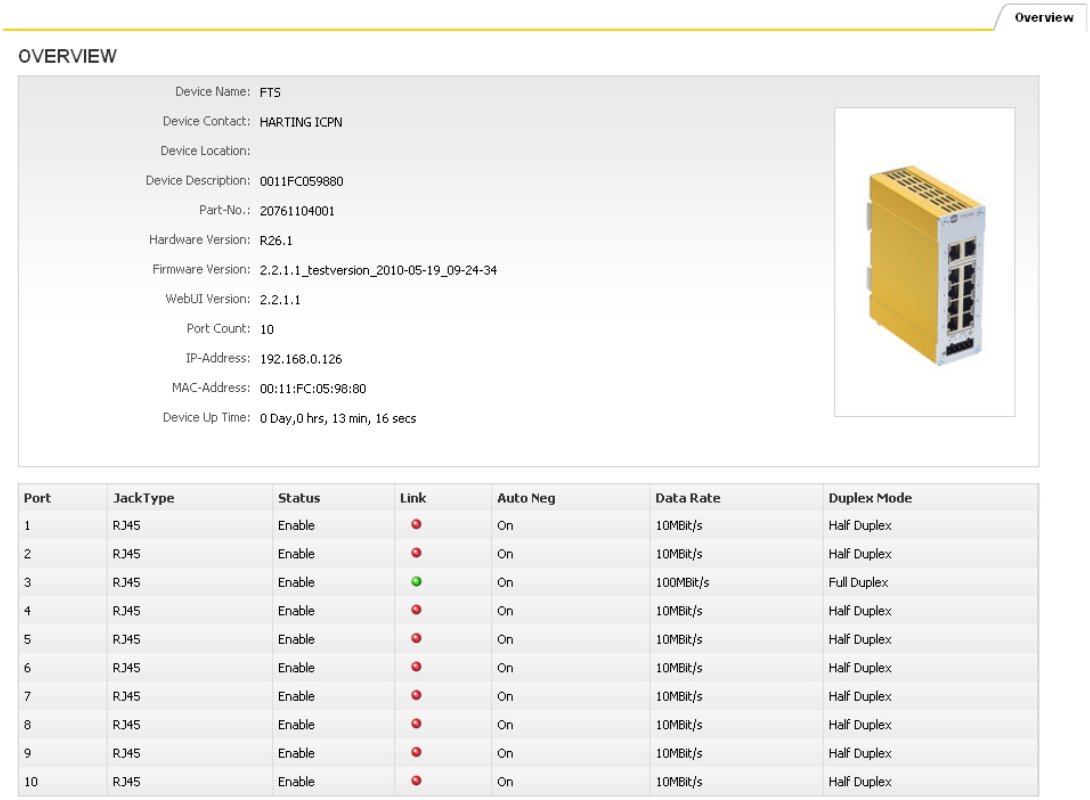
Guest The access category ***Guest*** enables all areas of the software to be viewed only.

Admin The access category ***Admin*** enables all areas of the software to be viewed and administered. No restrictions apply to making settings or alterations. This is the normal administrative user account for making switch settings.

6. The Overview Section

After you login to the switch, the active window displays an overview of the switch and the main settings for each of the ports. No changes can be made in this window. To access this section, simply click on ***Overview*** in the two-level menu tree displayed at the left of the window.

The top right section of the Overview window contains an illustration of the particular Ethernet Switch you are connected to. In addition, general information is displayed at the top left of the Overview window:



Port	JackType	Status	Link	Auto Neg	Data Rate	Duplex Mode
1	RJ45	Enable		On	10MBit/s	Half Duplex
2	RJ45	Enable		On	10MBit/s	Half Duplex
3	RJ45	Enable		On	100MBit/s	Full Duplex
4	RJ45	Enable		On	10MBit/s	Half Duplex
5	RJ45	Enable		On	10MBit/s	Half Duplex
6	RJ45	Enable		On	10MBit/s	Half Duplex
7	RJ45	Enable		On	10MBit/s	Half Duplex
8	RJ45	Enable		On	10MBit/s	Half Duplex
9	RJ45	Enable		On	10MBit/s	Half Duplex
10	RJ45	Enable		On	10MBit/s	Half Duplex

*Figure 5 The **Overview** section*

Device Name: displays the name of the device. The default is the type of Ha-VIS FTS switch in use.

Device Contact: Displays contact information, as defined by the user in the **General Settings** section.

Device location Displays the location of the device, as defined by the user in the **General Settings** section.

Device Description: MAC address of the switch

Part No. displays the HARTING part number of the switch.

Hardware Version displays the hardware version number of the switch management board.

Firmware Version displays the firmware version number of the switch.

WebUI Version displays the version of the web interface.

Port Count displays the number of ports on the switch.

IP-Address displays the currently assigned IP address on the switch.

MAC-Address	displays the unique hardware MAC address on the switch.
Device Up Time	displays the duration that the switch has been powered up.

The table at the bottom of the Overview window has the following columns for each port. (Note that information cannot be changed in this window. Basic port settings can be altered from the **System Settings** → **Port Settings** menu section.)

Port	displays all available switch ports.
Jack Type	displays the compatible media or jack type for the port
Status	displays the current status of the port. *Enable* means that the port is enabled; ***Disable*** is displayed if the port is disabled. (A port can be disabled in the **System Settings** → **Port Settings** section.)
Link	displays the status of the port. A red circle indicates that there is currently no existing link, while a green circle indicates an existing link.
Auto Neg	displays the negotiation state. Auto-negotiation is a technology for ensuring compatibility of a network component with the network. This column indicates if the Auto-negotiation function for the port is activated (**ON**) or deactivated (**OFF**).
Data Rate	displays the data transfer mode for the respective port.
Duplex mode	displays the port duplex mode. ***Half duplex*** means that data flows in one direction via the port at a given time; ***Full duplex*** enables data flow in both directions.

7. The Systems Settings Section

The System Settings section is composed of the following sub-sections: ***General Settings***, ***Port Settings***, ***User Management***, ***SNMP Settings***, ***Network Discovery***, ***Time Settings***, and ***File Transfer***. Each of these sections is described below.

7.1 General Settings

In order to commission the Ethernet Switch, the IP address and subnet mask must first be modified to suit the connected network (refer to the ***Quick-start Guide*** for setup instructions). If a DHCP server (Dynamic Host Configuration Protocol) is running on your LAN, you can specify ***Dynamic*** under the ***IP Address Mode*** setting.

Note

Context-sensitive help is available throughout the menu structure by simply clicking on the question-mark tab at the top right corner of the window.

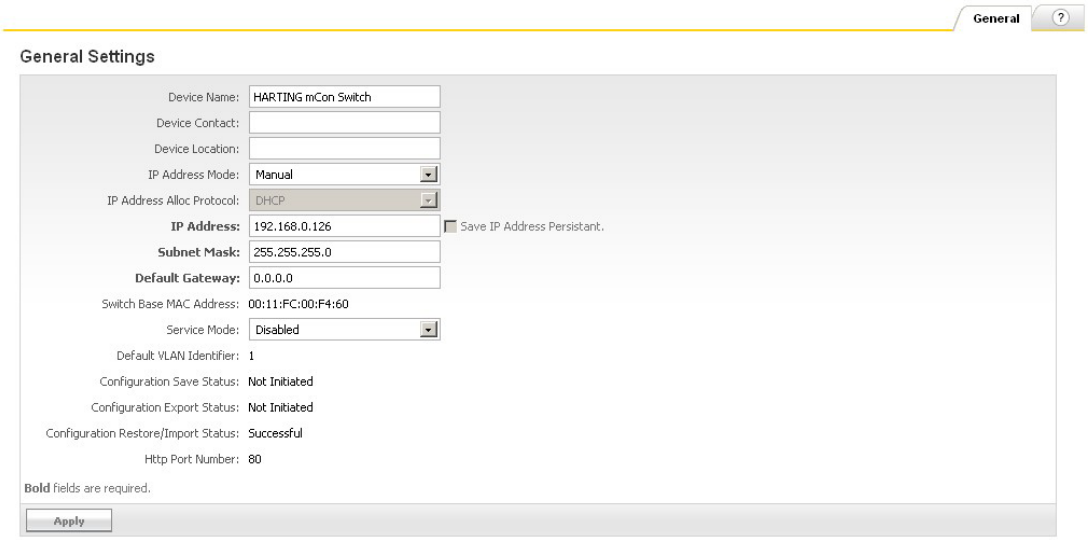


*Figure 6 The **General Settings** window*

The following general settings can be displayed or specified:

Device Name	specify a descriptive text for the device name
Device Contact	specify a descriptive text for the device contact
Device Location	specify a descriptive text for the device location
IP Address Mode	specify the switch IP addressing mode. If ***Dynamic*** is selected in the drop-down list then the switch is assigned a valid IP address and subnet mask during system initialisation by the DHCP server. If ***Manual*** is selected in the drop-down list, the IP address and the subnet mask and optional the address of the ***Default Gateway*** must be entered manually. When using a DHCP server, it is also possible to assign a static IP address to the Ethernet Switch (to its MAC address) in the settings of the DHCP server. The IP switch will be assigned to the Ethernet Switch each time the system starts up. This makes it possible to centralize the address administration of a large number of Ethernet switches.

IP Address	specify the IP address of the switch. IP addresses are assigned automatically if a DHCP server is installed.

Note

The IP address assigned to the switch must be **unique** for that connected network! Connectivity problems will arise if two network components are assigned the same IP address (always after the IP address at first or change to DHCP mode).

Save IP Address Persistent	check this box to save the IP address permanently. You will no longer be able to connect to the switch using the old IP address. Using your web browser, connect to the switch using the new IP address.
Subnet Mask	specify the subnet mask for the network. If the subnet mask is entered manually, it must be identical with the subnet used in the network. This value is assigned automatically if you have a DHCP server.
Default Gateway	Specify the default gateway for the switch or 0.0.0.0 if outside communication is permitted
Service Mode	Enable or disable the Service Mode Detection on the switch.

ATTENTION

It is recommended to keep the Service Mode Detection enabled all the time. In case of a misconfiguration, the switch can be reset to factory defaults. There is no other possibility to reset the switch.

Be sure to remember to click on the *Apply* button to save your changes. Then click on the ***Save Configuration*** button in at the bottom of the window to save the settings permanently.

The lower section of the ***General Settings*** window lists additional status information. This includes: the switch MAC address, the default VLAN identifier, the configuration save status, the remote save status, the configuration restore status and the HTTP port number.

7.2 Port Settings

This section allows you to change the settings for the switch's Ethernet ports. The ports can be individually enabled (up) or disabled (down). The data transfer rate and mode of data flow can be determined as well as the compatibility parameters for the network. Note that there are two tabbed sections (***Basic Settings*** and ***Port Control***) where these settings can be made.

7.2.1 Basic Settings tab

*Figure 7 The **Basic Settings** tab*

In this tabbed section, the administrative state of individual ports can be specified. Each port row has the following columns.

Select/Port select the port that you would like to change by clicking on the checkbox here (in most cases automatically done if you alter one parameter in the row)

Admin State select the desired state of the port. A port can be either enabled (up) or disabled (down).

Link Status displays the port status. A green circle in this column indicates that a device is connected to this port. A red circle indicates that no device is connected or ***Admin State*** is down.

7.2.2 Port Control tab

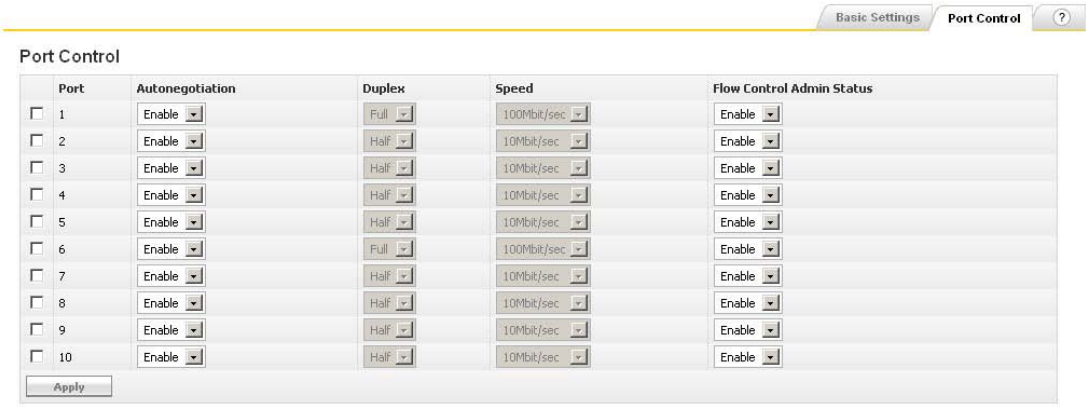


*Figure 8 The **Port Control** tab*

In this tabbed section, the characteristics of individual ports can be specified in the following columns:

Select/Port	select the port that you would like to change by clicking on the checkbox here.
Autonegotiation	select whether Auto-negotiation is disabled or enabled. Auto-negotiation is a function which enables the participating interfaces to automatically determine the best possible transmission parameters. The Auto-negotiation function can either be activated (***Enable***) or deactivated (***Disable***). If ***Enable*** is selected, the auto-negotiated settings will be used and the data-rate and duplex columns will be greyed out.
Duplex	select the data transmission mode for the respective port from the drop-down list. ***Half*** means that data flows in only one direction via the port at a given time; ***Full*** enables data to flow in both directions simultaneously.
Speed	select the data transmission rates for the port from the drop-down list: 100 Mbit/s or 10 Mbit/s, 100 Mbit/s or 1 Gbit/s, depending on the type of port interface.

7.3 User Management

This section allows you to specify a new password for the ***admin*** or ***guest*** account.

*Figure 9 The **User Management** section*

The switch software is password-protected to prevent unauthorized access. The admin password must consist of at least six characters. The password must always be entered to gain access to the software.

There are two access levels, which can be chosen from the drop-down list:

Admin	all rights are available.
Guest	all settings and values can only be viewed. It is not possible to alter the password or other settings.

The system administrator is authorized to alter the valid password for the access levels for the administrator and guest in this section. The admin password must be specified correctly before you can change the guest password. Click ***Apply*** to confirm your entry. The new password will become valid when you will login next time.

If the administrator password is forgotten or if it becomes necessary to alter it due to technical reasons, this process can be carried out in the service mode. To learn how to activate the Service Mode, please refer to Chapter 16 **The Service Mode**.

Note

A change in password must be confirmed by clicking on the *Apply* button. It is not sufficient to just hit ***Enter***. This password is safed persistent.

7.4 SNMP

SNMP (Simple Network Management Protocol) is the most widely-used network management protocol on TCP/IP-based networks. SNMP provides an easy mechanism for managing a network using a simple Command-Response protocol defined between the Manager and the managed entities. The management is performed through MIBs (Management Information Base) supported by the managed entities. The MIBs contain configuration elements, which can be either ***Viewed*** (GET) or ***Modified*** (SET) by the Managers.

SNMPv1/v2 could not provide the required security. One could easily decode the PDUs with a packet analyzer to find out the valid community name for the Agent.

SNMPv3 is designed mainly to overcome the security shortcomings of SNMPv1/v2. USM (User based Security Model) is the main feature added as part of the SNMPv3 specification. USM provides for both encryption and authentication of the SNMP PDUs. With SNMPv3, the SNMP communication is completely safe and secure.

The configuration of the switch can be accessed and changed directly using SNMP commands. This section allows you to specify the basic SNMP settings. This switch software now supports SNMP versions 1/2c and 3. You may also enable both versions simultaneously.

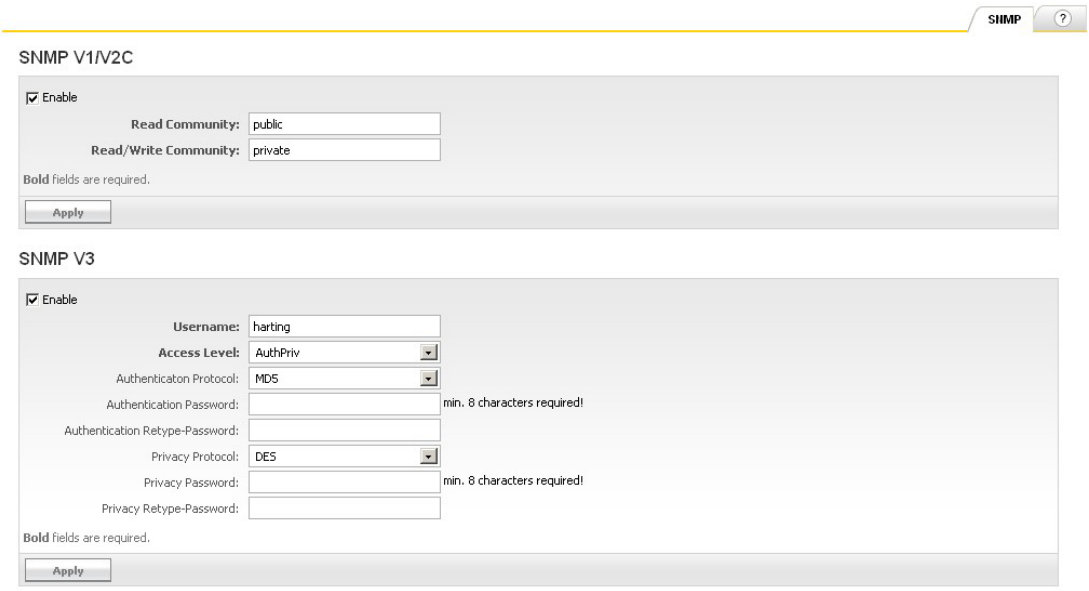


*Figure 10 The **SNMP** section*

The following settings may be made:

SNMP V1/V2C Enable

For V1/V2 operations, the HARTING SNMP Agent provides a ***Community*** based ***Security Mechanism***. Community names are encoded into V1/V2 messages and the Agent verifies the privilege status of the community name before responding to it. Community names are associated with the privilege status. The privilege status can be of type read-only or read-write.

Enable	Check this box to launch the SNMP agent and allow access to the switch via SNMP version 1/2c.
Read Community	Specify the community name for SNMP read access. The default is ***public***.
Read/Write Community	Specify the community name for SNMP read and write access. The default is ***private***. This community string acts as an SNMP password; you should pick one that it diffi cult to guess.

SNMP V3

The HARTING SNMP Agent provides complete support for User based Security Model.

The following security algorithms are supported:

- **Authentication** HMAC MD5 and HMAC- SHA
- **Encryption** DES-CBC

and it supports all three levels of security.

- **NoAuthNoPriv** No Authentication and no Privacy
- **AuthNoPriv** Authentication and no Privacy
- **AuthPriv** Authentication and Privacy

Enable	check this box to launch the SNMP agent and allow access to the switch via SNMP version 3.	
User	specify the user name for SNMP version 3 access (the default user name is ***harting***).	
Access Level	***NoAuthNoPriv***	No authentication and no message encryption
	AuthNoPriv	Enables message digest (MD5) or Secure Hash Algorithm (SHA) packet authentication, but no message encyption
	AuthPriv	Both authentication and message encryption.
Authenticaton Protocol	Protocol used for User Authentication (MD5) or Secure Hash Algorithm (SHA)	
Password	specify the SNMPv3 password twice. It must be at least eight characters.	
	A MIB Management Information Base) file can be found on the CD that is included with the switch. The MIB information allows you open-standard access to the switch using SNMP management software.	
Privacy Protocol	Protocol used for privacy.	
Privacy Password	specify the SNMPv3 privacy password twice	

Note

If you are not planning on using SNMP, you should make sure that both versions are disabled so that maximum security is ensured.

7.5 Network Discovery

This section allows you to activate LLDP (Link Layer Discovery Protocol). LLDP can be used to determine the capabilities of devices on your network. It allows the switch to announce its capabilities and other media-specific configuration information to the local area network.

The Link Layer Discovery Protocol allows systems on an Ethernet LAN to advertise their key capabilities and to learn about the key capabilities of other systems on the same Ethernet LAN. Consequently, this promotes a unified network management view of the LAN topology and connectivity to aid network administration and trouble-shooting. The station and capabilities information is conveyed in protocol frames called Link Layer Discovery Protocol Data Units (LLD PDUs). In general, a network administration station can be connected to one single switch and from there can access the connectivity information of the complete network within an enterprise. The switch (or other device) that collects the information for the network management station to view and LLDP process, also provides notifications to alert an operator about changes in the network topology, in the form of SNMP traps.

Note

If activated the PROFINET in the mask ***Industrial Profile*** (see **chapter 7.10**) the settings of LLDP are fixed.
If ***Automatic Edge Port Detection*** is enabled, LLDP is activated fix too.

7.5.1 LLDP Settings tab

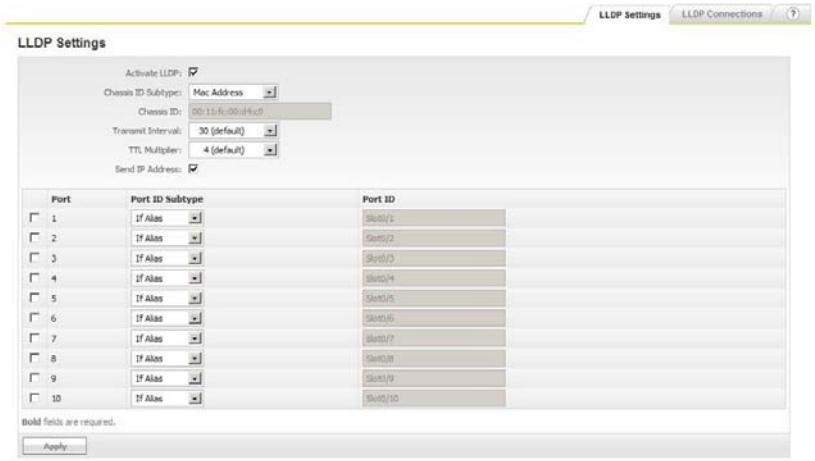


*Figure 11 The **Network Discovery** section*

At the bottom of this window, the *Refresh* button allows you to refresh your view of neighbouring chassis IDs, port IDs, and IP addresses.

Activate LLDP	Select whether to disable or enable LLDP on the switch globally on the switch.
Chassis ID Subtype	Enter the Chassis ID Subtype which should be written in the LLDP packets.
Chassis ID	Enter the Chasses ID which should be written in the LLDP packets., if sub type is locally assigned.
Transmit Interval	The interval at which LLDP frames are transmitted on behalf of this LLDP agent. The default value for the Transmit Interval is 30 seconds., but 5 seconds in either PROFINET or ETS Edge Port Detection is enabled.
TTL Multiplier	The time-to-live value expressed as a multiple of the Transmit Interval.
Send IP Address	Transmit the IP address of the switch in every LLDP packet.

Table description The Port ID can be set individual for each port via the table.

Note

The interval between to LLDP PDUs is calculated with the following algorithm:

LLDP Intervall = Transmit Interval x TTL Multiplier

7.5.2 LLDP Connections tab

The LLDP table shows all direct connected neighbours and the corresponding information. The *Refresh* button allows you to refresh your view of neighbouring chassis IDs, port IDs, and IP addresses. The following information are shown in the table.

- **Local Port** Local port where the information was learned
- **Neighbour Chassis ID** Chassis ID of the neighbour device
- **Neighbour Port ID** Port ID of the neighbour device
- **Neighbour IP** IP address of the neighbour device (not always available)

7.6 Time Settings

This section allows you to set the system time for the switch. The time can be specified manually or automatically via an SNTP (Simple Network Time Protocol) server.

The Ha-VIS FTS Ethernet Switches include an implementation of the Simple Network Time Protocol. This is a subset of the Network Time Protocol used to synchronize computer clocks in the Internet. SNTP is useful and sufficient when the ultimate performance of a full NTP implementation is neither needed nor justified, which is the case with network infrastructure devices for Ethernet and IP based switching and routing. HARTING switches implements the client portion of the SNTP protocol and does not implement the server portion. The administrator can choose whether to set the system clock manually or to enable SNTP. If SNTP is enabled, the SNTP implementation gets the time from the server. The SNTP implementation also has callouts to set the system time based on the time received from the SNTP server.

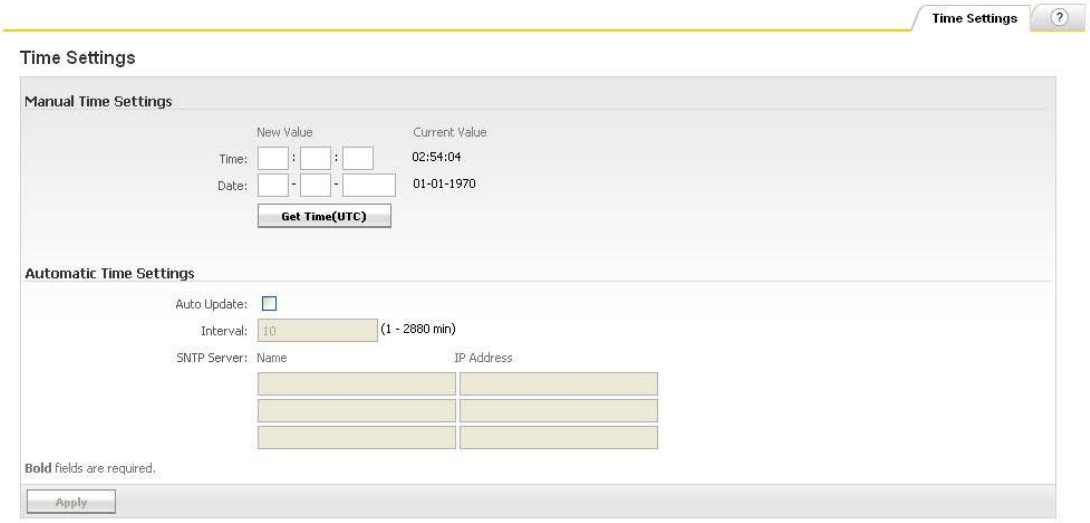


*Figure 12 The **Time Settings** window*

Manual Time settings

Time Specify the system time manually.
The current system time is displayed below ***Current Value*** in the format hours:minutes:seconds (24-hour format). The time can be specified manually in the ***New Value*** column.

Date Specify the date manually. The currently set date is displayed below ***Current Value*** in the format day-month-year. The date can be specified manually in the ***New Value*** column.

Get Time Click on this button to enter the computer system's time and date into the fields above. The time information will be taken from the computer on which the web browser is running.

Automatic Time settings

Auto Update Check this box in order to receive the system time automatically with the support of an SNTP server.

Interval Specify the period of time in minutes. The system time is then updated periodically at this interval.

SNTP Servers Specify the name and address of the SNTP servers that will supply the system time here. The address can be that of either a publicly-accessible PC (for example ntp1.co.uk) or a specified PC in the network that serves as a time generator. The IP address must also be specified. More than one server may be specified to provide redundancy.

Note

The Ethernet Switch does not store time and date when turned off for a minimum of 24 hours. The switch starts with the following system settings after first booting up:
Time 00:00:01
Date 01-01-2000
The Ethernet Switch does not automatically adjust to summer and winter time. This should be taken into account when evaluating log files or alarm-generated e-mails in which the time is logged.

7.7 DHCP Relay Agent: Option 82

Upgrading and changing the structure of Ethernet networks causes usually a lot of administrative effort. Configuration of security and addressing procedures has to be redone every time a device will be changed. Replacing or moving of network devices causes a lot of trouble, because some network mechanisms such as dynamic IP address assignment are MAC based.

DHCP Option 82 provides a mechanism for generating IP addresses based on the location of the client device in the network. A client device can be any device attached to the switch or a switch itself.

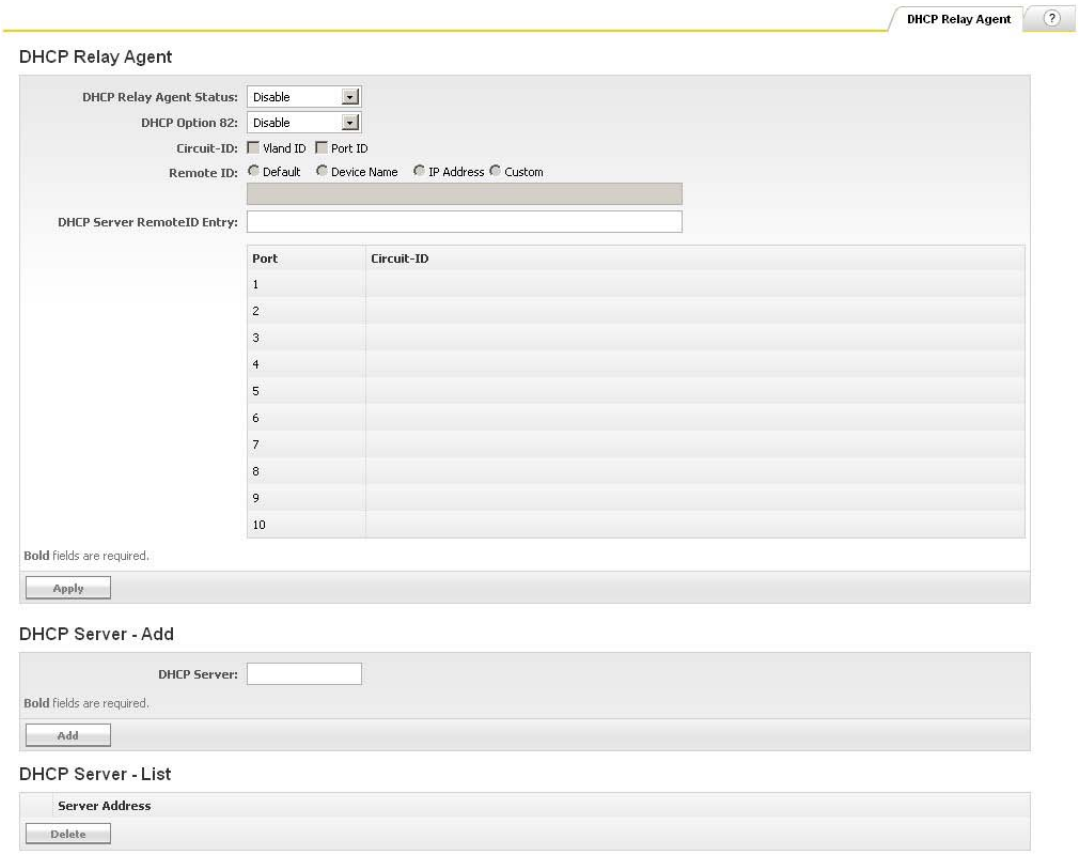


*Figure 13 The **DHCP Relay Agent** tab*

DHCP Relay Agent Status	Enables or Disables the DHCP Relay Agent on the switch. To use Option 82 this option must set to enable.
DHCP Option 82	Select whether to disable or enable Option 82 on the switch.
Circuit-ID	Defines the Circuit-ID to identify the location of the end device in the network.

Attention:

The Port ID must be enabled to guarantee the correct work of DHCP Option 82.

Remote ID	Defines the Remote-ID for the switch which will be added to the DHCP packets. *Default* Set the Remote-ID to the default value (MAC address). *Device Name* Add the Device Name as Remote ID. *IP Address* Use the IP address *Custom* A custom value can be added as the Remote-ID.
DHCP Server RemoteID Entry	Calculated value of the Remote ID. If the Remote ID is used by the DHCP Sever, this value must be entered on the server side.
DHCP Server	The IP address of the DHCP Server must be entered here.

7.8 File Transfer

Configuring the Switch every time on restart is very tedious. To ease this job, the entire configuration of the Switch must be saved in Flash and so is restored on restart of the system. The switch may also make use of the services of TFTP and HTTP to download the configuration file from an external TFTP server or storage drive and to set the configurations as stored in the configuration file.

This section allows you to transfer files to and from the switch. File transfers are used for importing or exporting specific saved configurations and for importing or exporting firmware. Uploading and downloading of the files can be done via a TFTP Server and very simple via HTTP.

The address of a TFTP (Trivial File Transfer Protocol) server can be specified for importing or exporting firmware or configurations. In order to transfer files to or from the switch, a TFTP server program must be installed on a connected PC. There are three different tabbed sections within this window.

7.8.1 Firmware tab

This tabbed section allows you to specify the IP address of the TFTP (Trivial File Transfer Protocol) server and the file name of the firmware file to be exported or imported. Be sure that you have the TFTP server running and configured properly on a separate computer. Click on the ***Import*** or ***Export*** button to begin the transfer.

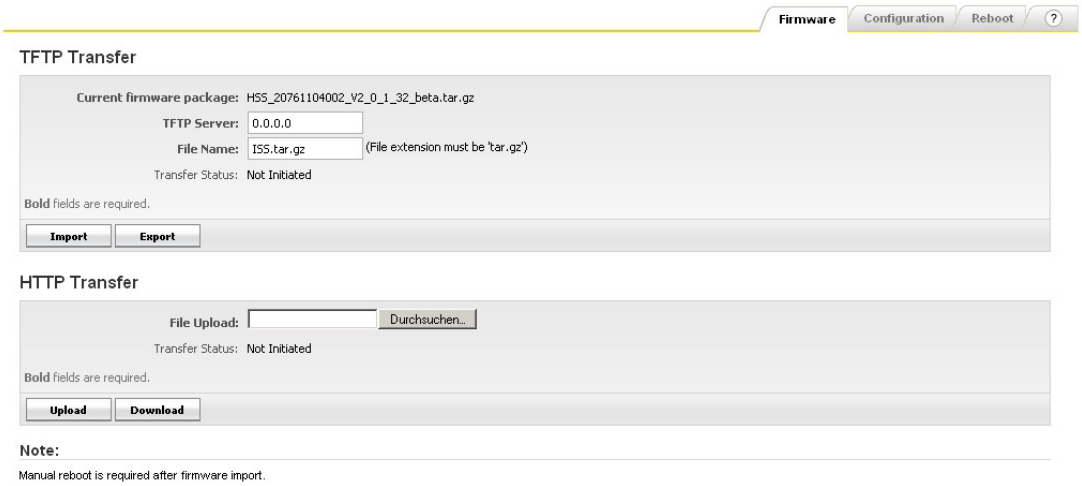


*Figure 14 The **Import/Export Firmware** tab*

Import (Load) a firmware

Select ***Import firmware*** in order to import a specified firmware file. Select ***Import*** to import the current firmware from the TFTP server or via HTTP from a remote file system.

Export (Save) a firmware

Save the current firmware to a file on a remote system. Select ***Export*** to export the current firmware to the TFTP server or via HTTP to a remote file system.

TFTP Transfer

This section allows you to specify the IP address of the TFTP (Trivial File Transfer Protocol) server and the file name of the firmware file to be exported or imported. Be sure that you have the TFTP server running and configured properly on a separate computer.

TFTP Server	Specify the IP address of the TFTP server
File Name	Specify the file name of the firmware packet file

Click on the ***Import*** or ***Export*** button to begin the transfer.

Note

The transfer status is shown in this window and will be updated automatically. Check in your TFTP server logs to see when the transfer is complete. Wait until the TFTP server log shows that the file has been transferred before rebooting. Rebooting is necessary after succsessful loading to install new firmware.

If you intend to load a new version of the firmware file from the TFTP server, we recommend that the existing firmware file be backed up first to the TFTP server.

HTTP Transfer

This section allows you to use HTTP data transfer for the firmware file to be exported or imported. Click on the Import or Export button to begin the transfer.

ATTENTION

Only select firmware files which are compatible with the device for the import functionality.

7.8.2 Configuration tab

This tabbed section allows you to load or save a configuration. The following settings are available.

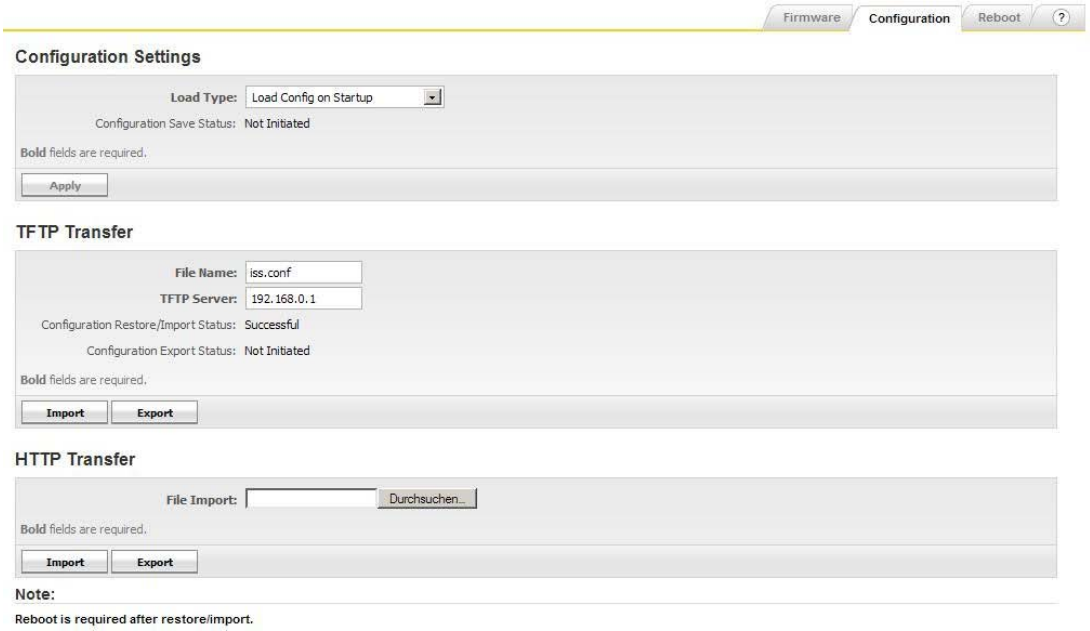


*Figure 15 The **Save/Load Configuration** tab*

This tabbed section allows you to load or save a configuration. The following settings are available.

Configuration Settings

Load Type	***Load Config on Startup***	Startup with the last saved configuration (default)
	Load Factory default on Startup	Startup with factory defaults

The status of the current action are shown at the bottom of the box. To start the switch with the factory default settings, you have to select "***Load Factory default on Startup***", press the ***Apply*** button and restart the switch.

Import (Load) a configuration

Select ***Import Configuration*** in order to import a specified configuration file. Select ***Import Configuration*** to import the current configuration from the TFTP server or via HTTP from a remote file system.

Export (Save) a configuration

Save the current configuration to a file on a remote system. Select ***Export Configuration*** to export the current configuration to the TFTP server or via HTTP to a remote file system.

TFTP Transfer

File Name	specify the file name to which the configuration file will be saved. The default file name is ***iss.conf***.

TFTP Server specify the IP address of the TFTP server where you will save the configuration.

The status of the current action are shown at the bottom of the box.

HTTP Transfer

This section allows you to use HTTP data transfer for the configuration file to be exported or imported. Click on the ***Import*** or ***Export*** button to begin the transfer.

Note

Reboot is required after restore/import.

Note

To save the configuration permanent to the flash memory, please see chapter **5.2 Saving changes with the Save Configuration button** for further details.

7.8.3 Reboot tab

To reboot the switch, click the ***Reboot*** button in this section. A timer will wait 10 seconds before execute the reboot. This is helpful if large networks should be reboot at the same time. The delay ensures that every switch in the network receive the command.

*Figure 16 The **Reboot** tab*

Note

Be sure that transfer process of firmware was successfully done before executing reboot.

7.9 The Fast Track Settings Section

This switch supports Fast Track Switching Technology. In this section it is possible to configure the FTS Mode, e.g. which frames should be preferred. It contains 2 Tabs, General FTS Settings and Custom Protocol Settings.

7.9.1 General FTS Settings tab

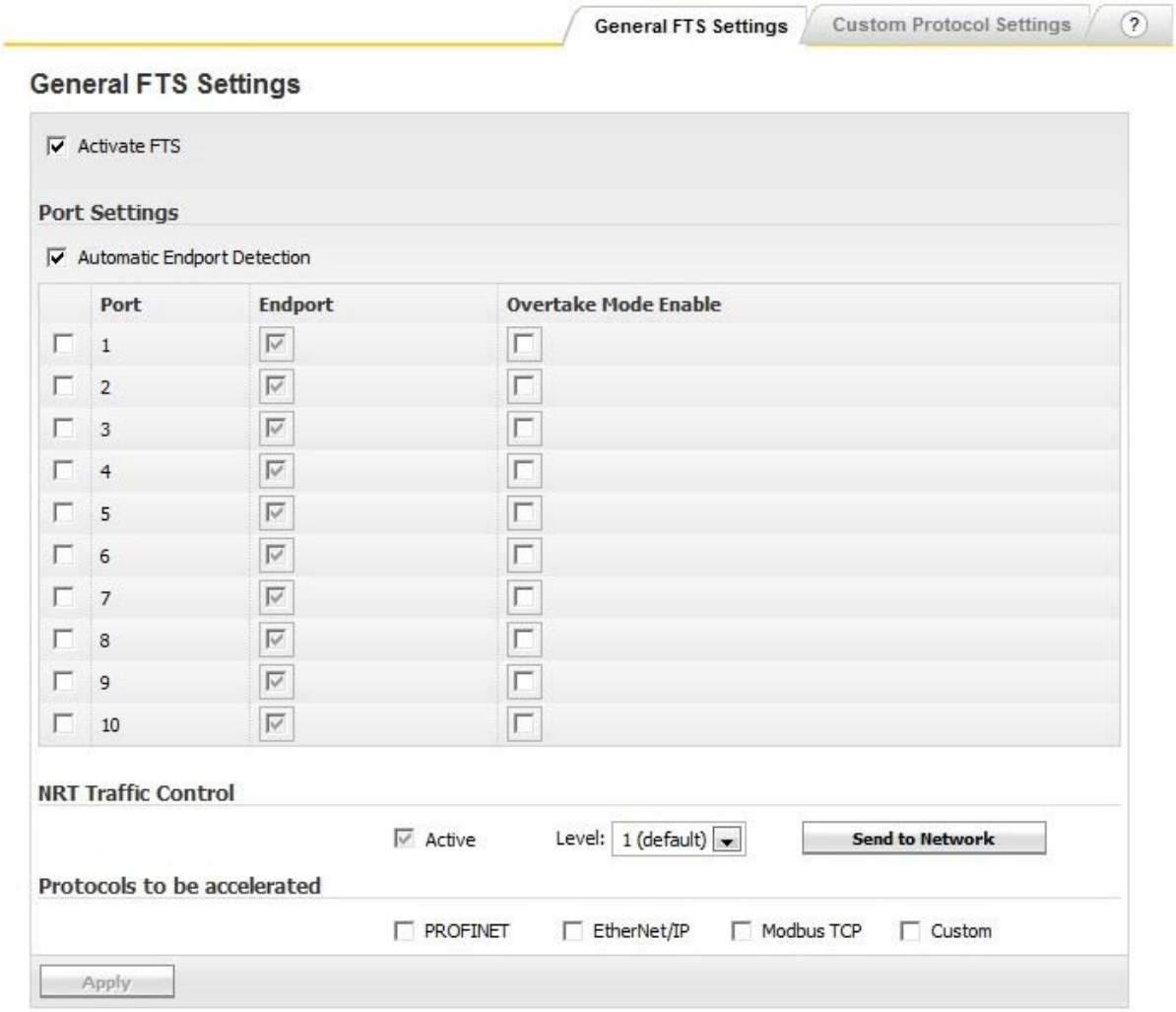


*Figure 17 The **General FTS Settings** tab*

When unset, the complete switch is put to Standard-Switching Mode (Store and Forward Switching Mode), no identifying and no accelerating of any frames in FTS-Mode is performed. In this mode all FTS-features are switched off. No detected protocol is enabled per factory default so the switch works in the Store and Forward Switching Mode.

Port Settings:

Automatic Endport Detection When set, the system detects the FTS-Ports and Endports (see below) automatically. This is the default setting.

Note

While Automatic Endport Detection is active, the user can not disable LLDP functionality

Endport	When set, the selected port is marked as an endport. This means on this port an end-device or a non-FTS-device is connected. If a Non-FTS-Device is connected to a port, it has to checked "FTS Endport". These settings are only necessary, if NRT Bandwidth Control is enabled. If it is disabled, no endport has to be defined. These setting are only necessary in combination with NRT Bandwidth control (see below).
Overtake Mode Enable	The Overtake Mode is part of the Fast Track Switching mechanism and means that an identified and prioritized frame (Realtime-frame, RT-frame) can suspend a Non-RT-frame (Non-realtime-frame, NRT-frame) for instant transmission. The NRT-frame is stored and will be sent afterwards again. This increases performance and all FTS-ports work in this mode. But it also means that there could be a fragment of the suspended frame. Normally this is filtered out at the next switch or device because of a corrupt checksum (FCS). But some devices might have a problem with this fragment if it occurs on the endport. Therefore the Overtake Mode can be disabled on these endports. When set, the selected endport also supports "overtaking". If it is not an endport it is not possible to disable the Overtake Mode for the port. That means that there will be no FTS-generated fragment to the connected device. But performance is decreased, in worst case about 1500Byte NRT could not be overtaken by RT, this means up to 125µs extra-time in worst case. This has to be calculated to stay deterministic.
NRT Bandwidth Control	For the highest performance for RT-frames this NRT Bandwidth Control can be switched off. However some applications might require a higher bandwidth for NRT-traffic. In this case it might happen that if there is a high amount of RT frames, nearly all NRT frames (especially if they a long) could be interrupted and will not be transmitted for longer periods of time. Therefore it is possible to ensure a certain bandwidth for NRT traffic by enabling NRT Bandwidth Control. There are up to seven levels to be set, default setting is 1. The higher the level the more NRT Bandwidth is guaranteed. Ensuring a certain bandwidth for NRT means a decrease in the performance for RT. So for each level increase about 125 µs have to be calculated for the worst case delay transmission time of RT-frames. Example: If level 2 is selected, 2* 125 µs = 250 µs have to be added to the maximum transmission time for RT frames. Recommendation is to set this on 1 or 2 for most applications.
Activate	When set the NRT Bandwidth Control is enabled. This is default setting.

Level The level of NRT Bandwidth can be selected, possibles values are 1 – 7, 1 means low amount of NRT traffic will be guided through, delay for RT is low, 7 means high amount of NRT traffic will be guided through, delay for RT is high (see Example above). Default setting is 1.

Send to Network If the setting of NRT Bandwidth Control is changed, these settings can be transmitted to the whole (FTS) Network to guarantee the same level of NRT Bandwidth Control in the whole FTS domain.

Detected Protocol Preconfigured profiles can be selected and which frames should be priorized and transmitted with FTS-Mode. 3 Profiles – ***PROFINET***, ***EtherNet/IP*** and ***Modbus TCP*** – are pre-configured. By selecting one of them, the relevant frames are identified and transmitted in FTS mode automatically. If more then one of them or different profiles are required, ***Custom*** has to be selected. On the ***CUSTOM*** tab the detailed settings have to than be made.

Custom Protocol Settings tab

On this tab it is possible to define different profiles (different from PROFINET, EtherNet/IP or Modbus TCP) or a combination of different kinds of protocols.

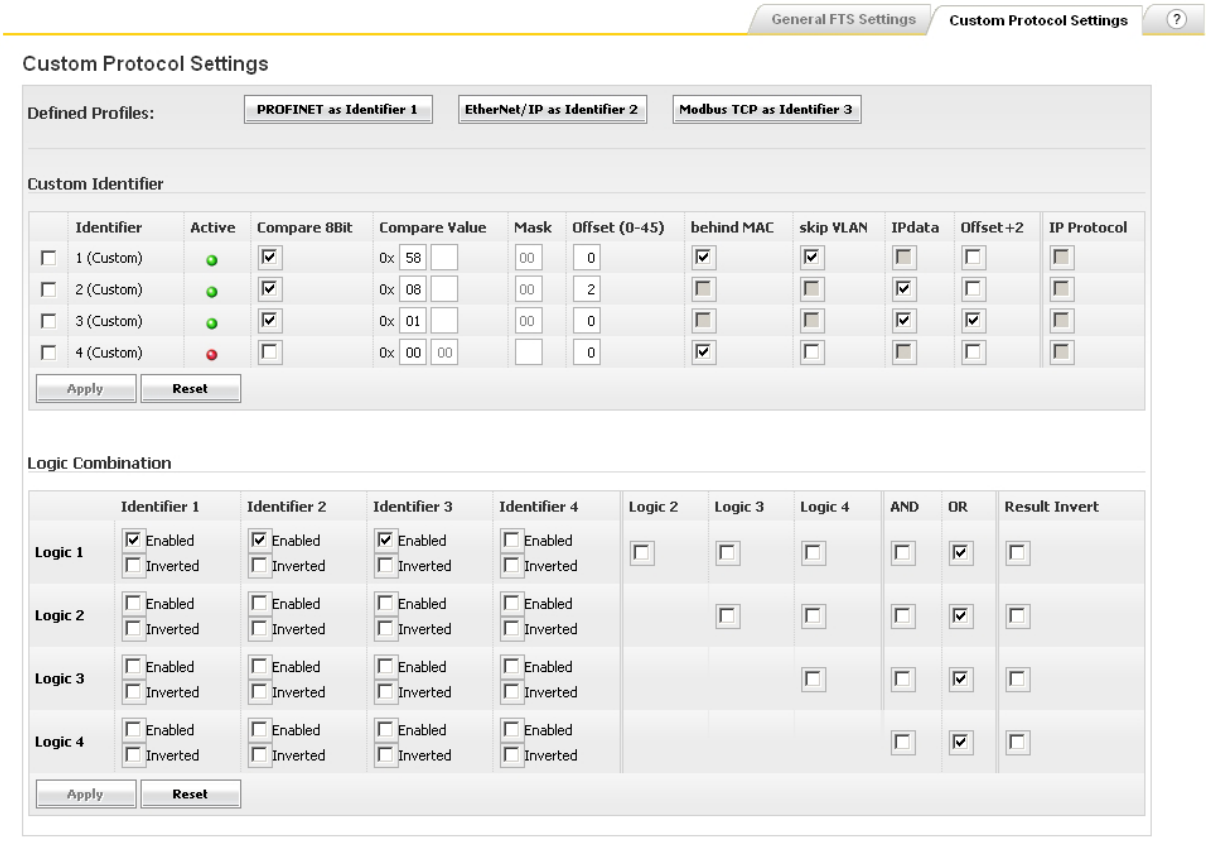


*Figure 18 The **Custom Protocol Settings** tab*

The Buttons ***PROFINET as Identifier 1***, ***Ethernet/IP as Identifier 2*** and ***Modbus TCP as Identifier 3*** will help to setup a combination of these or to setup another type of protocol. By using the buttons the identifiers of the selected profile will be put in the identifier settings below

as an example. These settings can be changed to adapt to customized solutions or be used for setting up combinations.

It is possible to setup up to 4 identifiers to enable the switch identifying protocols to transmit them in FTS Mode. This can be 4 different types of protocols, a combination of them or protocols with more than one necessary attribute to be identified.

To use an identifier it has to be checked at active.

The ***Active Identifiers*** are shown with green mark, the others red.

If compare ***8Bit*** is not checked (default), the comparison will be done with ***16Bit***, if it is checked the comparison will be done with 8 bit and a mask.

Example 16Bit:

hex 8892 (PROFINET)→all these Bits have to be the same in the Ethernet header of the frame, this means only frames with 8892 at the specified Ethernet header location will be prioritized.

Example 8Bit:

Value is hex 5 which is 0101 binary

Mask is hex 7 which is 0111 binary

→the last three bits are necessary in this example, means the combination 101 binary. The first Bit is set to 0 in the mask and will be not looked for in the value then.

All values and masks have to be put in as hex.

Note

Bits that have to be ignored (0 in mask), must also be set to 0 in the value-field.

Depending the setting of compare ***16Bit*** in value/mask a 16 bit value or a 8 bit value and a mask have to be inserted. These are identification attributes of the protocols that shall be transmitted in FTS Mode.

The next settings in these rows are the location where to find these attributes inside the Ethernet header. Offset (0-45) describes the offset to the starting point of counting, where 0 means the first byte after starting point. The offset has to be entered in number of bytes (0-45).

If ***MAC*** is checked, the counting will start with the first byte following the MAC-source-address of a frame.

If skip ***VLAN*** is also checked, the counting will start directly behind the MAC address if no VLAN Tag is inserted else directly behind any existing VLAN Tags.

If Ipdata is checked, the counting starts with the first byte following an IP header. If the option is set, it implicitly requires an IP Frame, else the identifier will report no match. For Ipv4 the header and any header options are skipped, for Ipv6 only the base header is skipped.

If ***Offset+2*** is also checked, the comparison is repeated at offset + 2 Byte, if the comparison at offset failed. This can be used to create a comparison for UDP or TCP port numbers, allowing checking if the port number exists in the source or in the destination port number field.

If ***IP protocol*** is checked, the compare value is compared with the protocol field found within the IP header for both IPv4 and IPv6 frames. The offset then has no meaning and is ignored If the frame is not an valid IPv4/v6 frame the identifier will report no match.

Examples:

PROFINET has a special Ethertype which is 8892. So an identifier with a 16Bit value with 8892 inside is chosen. The counting should start in the Ethertype (→ Offset=0), so if there

is no VLAN tag the counting starts from the MAC (MAC is checked), if there is a VLAN tag it is skipped for this counting (skipVLAN is checked). By activating this identifier all PROFINET frames with Ethertype 8892 are identified and transmitted in FTS-Mode.

Figure 19 Example

EtherNet/IP has the destination port number 2222 in the UDP-Header. 2222 is 08AE in hex. In the Ipdata-field it is located with an offset of 2.

In this section it is possible and necessary to combine the identifier results. This is possible with up to 4 logical combination levels Logic 1 to Logic 4.

Note

Logic 1 must always be used, as this logic-stage determines the final match result. If nothing is selected in logic1, there will be no transmission in FTS-Mode, regardless if identifiers above are active or not.

For the INPUT LOGIC the identifiers 1 to 4 or the inverted identifiers 1 to 4 can be selected. E.g. if a frame has to have the identifier 1 but not the identifier 2, identifier 1 is checked and inverted identifier 2 is also checked.

Furthermore the results of lower logical combinations can be used as input for a higher logic level in the RESULT section. So e.g. the result of Logic 4 can be combined with Logic 3 via Logic 1 The result of Logic 3 can be used in Logic 2 and in Logic 1 all lower results can be used. You can also combine Logic-results and identifiers.

In the section OUTPUT LOGIC it is possible to combine the selected inputs via OR or AND. OR means one of the inputs have to be true and AND means all of the inputs have to be true. Also the results of this can be inverted with RESULT INVERT. This could e.g. be useful when the result is used as input to a higher logic.

Example 1:

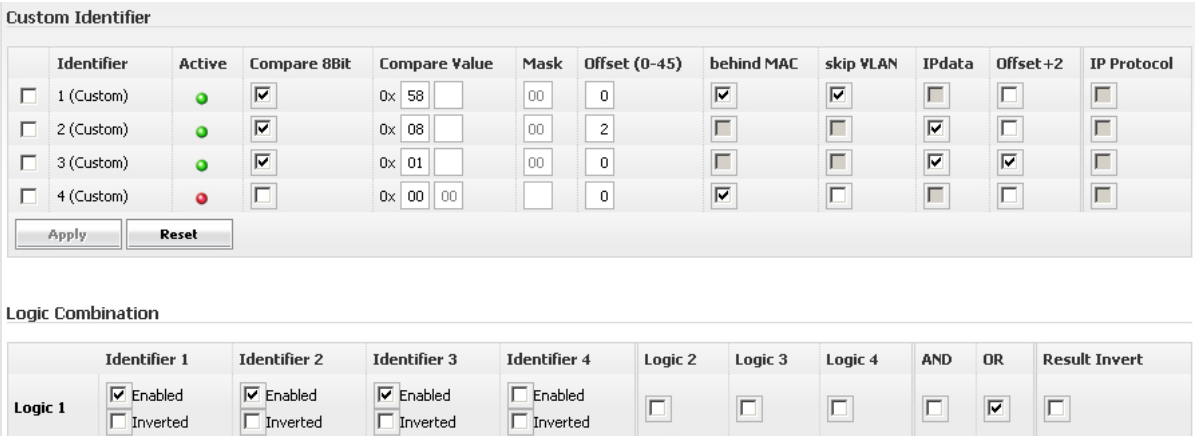


Figure 20 Example 1

PROFINET, EtherNet/IP and Modbus TCP shall be used in the network and all their frames should be transmitted in FTS Mode. Identifier 1 is set to the PROFINET values, identifier 2 to Ethernet/IP and Identifier 3 to Modbus TCP settings. All these 3 identifiers are combined with

OR in a single logic operation. This will set the switch identifying and accelerating all the frames with PROFINET or EtherNet/IP or Modbus TCP identification inside:

Example 2:

Two profiles – PROFINET and a customer specific one – shall be identified and accelerated.

The customized profile has two attributes:

- Ethertype is 0x22CD
- The following byte is significant for the RT frames of this profile, the first 4 Bit of it are 1110 This means the Bytes behind the MAC-Address start with: 22 CD E…

These are the settings for this example:

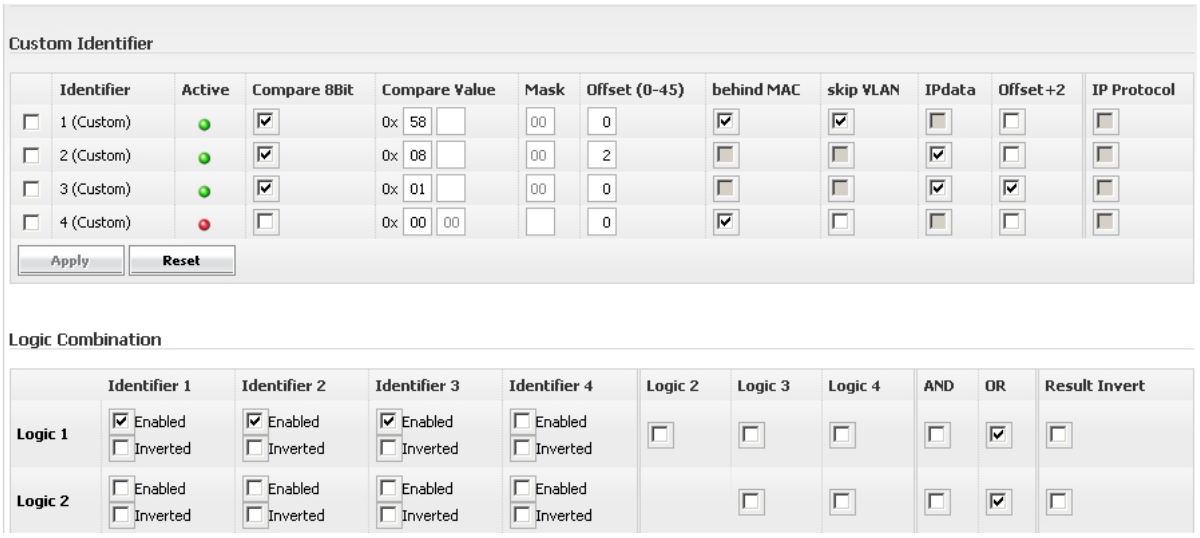


Figure 21 Example 2

Identifier 1 is activated and set to PROFINET, 0x8892 as the compare-value. The Ethertype has to be checked, this means Offset 0 and skipVLAN to start comparison directly behind the MAC-Address for frames with no VLAN Tag and directly behind the CLAN Tag if there is one.

Identifier 2 is activated and set to 0x22CD for this is the specific Ethertype of this profile, comparison on the same location like above.

Identifier 3 is activated and set and compare 8Bit is checked to be able to identify those 4 Bit of the following byte. The compare value is E0 (to fulfil 1110 0000 binary, see above), the mask is F0 (F0 hex means 1111 0000 binary) to compare exactly 1110 on the 4 interesting bits. The offset is set to 2 to start comparison directly behind the Ethertype (2 Bytes).

To combine these profiles and attributes correctly, it is necessary to combine Identifier 1 (which is PROFINET in this case) with OR to Logic 2, which is the combination of the two features of the customer specific profile.

Inside Logic 2 the Identifier 2 (which contains the Ethertype 22CD) is combined AND with Identifier 3 (which describes the E in the next Byte).

With this combination it is possible to accelerate PROFINET as well as a customized profile which has more than one attribute to be identified as a RT frame.

7.10 The Industrial Profile Section

In this section it is possible to activate the industrial profiles PROFINET or EtherNet/IP. By default both are not activated.

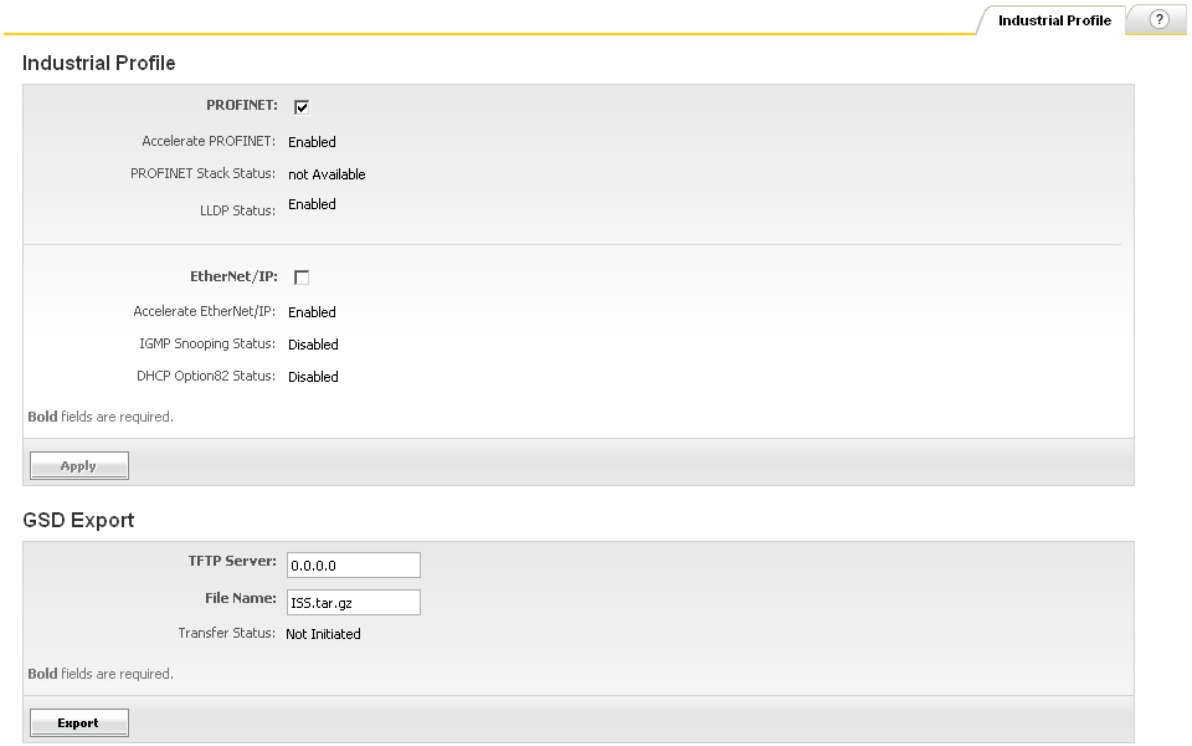


*Figure 22 The **Industrial Profile Section** window*

If PROFINET is checked the following settings are operated:

- LLDP will be activated (if it was disabled before)
- The PROFINET I/O Stack will be enabled
- PROFINET-Frames (Ethertype 8892) will be identified and accelerated in FTS-Mode

In the next window you can choose between three options (see figure 23)

ATTENTION
• PROFINET will be set as Identifier 1 for FTS Custom Protocol
• PROFINET Stack will be enabled
• REBOOT will be executed
Keep current IP settings or reset to PROFINET defaults?
Current
PROFINET default
Cancle

Figure 23 IP settings in PROFINET Profile

When choosing the button "***Current***" no settings will be changed and also IP address and subnet mask remain constant.

Choose the button "***PROFINET default***" to clear the IP address, subnet mask and the device name. The switch will wail for IP settings via DCP sent e.g. by PLCs. All other settings remain constant.

ATTENTION

After clearing the IP settings by choosing "***PROFINET default***" the switch is not reachable via web-Access until it gets a new IP address from the PLC via DCP.

Choose the button "Cancel" to abort the task for enabling the PROFINET Profile.

After reboot the diagnosis LED is on red until the connection between switch and PLC succeeded.

Note

All following configurations should be done by an engineering tool in PROFINET enviroment !

Note

If PROFINET is checked it is not possible to disable LLDP and it is not possible to change Transmit Interval. PROFINET requires 5 seconds, this value is fix during PROFINET mode.

The following LLDP settings will automatically be made.

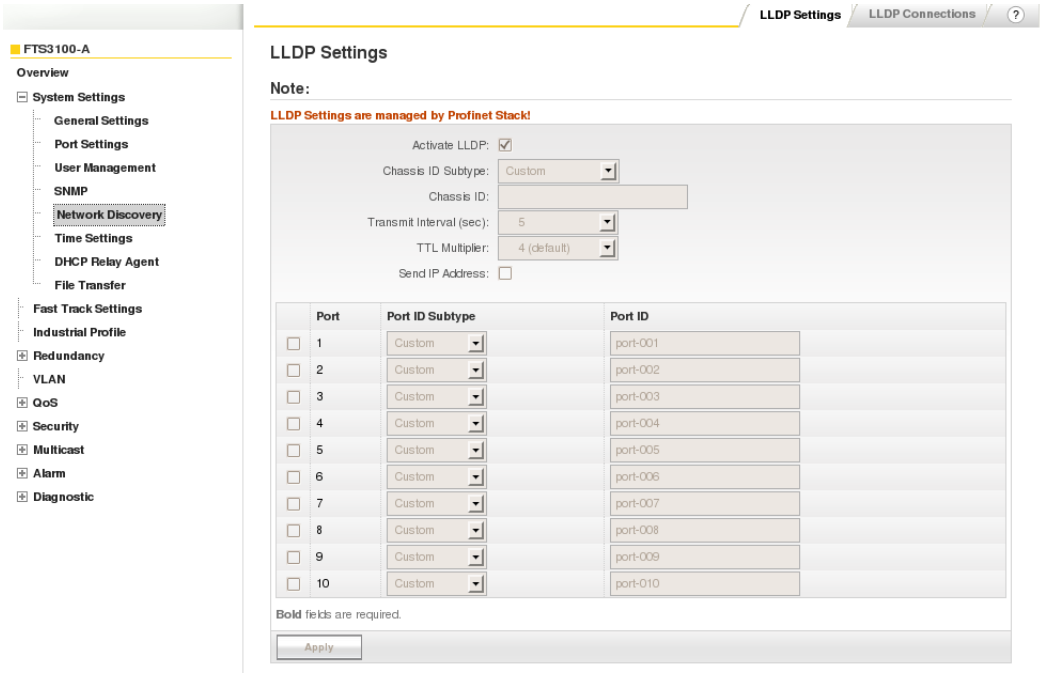


Figure 24 LLDP settings for PROFINET

If EtherNet/IP is checked the following settings are operated:

- IGMP Snooping will be enabled
- DHCP Option 82 will be enabled
- EtherNet/IP Frames will be identified and accelerated in FTS-Mode

With GSD Export it is possible to download the GSD-File from the Switch to a specified location via HTTP. The address of the connected HTTP Server has to be inserted. By pushing the ***Export*** button the file (named in File Name) will we exported to the HTTP Server.

8. The Redundancy / RSTP Section

This section allows you to construct redundancy within your network topology. Redundant or spare links can be implemented to provide automatic backup paths if an active link fails.

STP (Spanning-Tree Protocol) is a link management protocol that provides path redundancy while preventing undesirable loops in the network that are created by multiple active paths between stations. To establish path redundancy, STP creates a tree that spans all of the switches in an extended network, forcing redundant paths into a standby, or blocked, state. For an Ethernet network to function properly, only one active path must exist between two stations. Multiple active paths between stations in a bridged network can cause loops in which Ethernet frames can endlessly circulate. STP can logically break such loops and prevent looping traffic from clogging the network. The dynamic control of the topology provides continued network operation in the presence of redundant or unintended looping paths.

One of the problems with the Spanning Tree algorithm is that, in a large LAN, it can take a considerable time for the LAN topology to stabilize following a reconfiguration event - times of the order of 30 seconds being typical of the original form of the algorithm. To avoid this, HARTING supports RSTP (Rapid Spanning Tree Protocol). The operation of RSTP provides rapid recovery of connectivity in case of a link failure. RSTP avoids large delays by calculating an alternate root port, and immediately switching over to the alternate port if the root port becomes unavailable RSTP in compliance with IEEE 802.1D (2004).

This section is divided into three tabbed sections for altering and viewing RSTP parameters: ***Basic Settings***, ***Port Settings*** and ***Port Status***. Each of these tabs is described below.

Note

When the switch boots up, Rapid Spanning Tree is enabled by default. The default configuration is applicable for most applications, normally no additional configuration are need to be done in this section.

8.1 Basic Settings tab

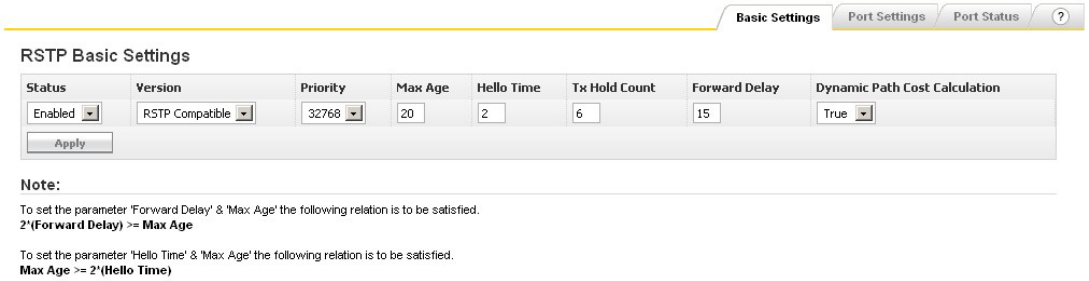


*Figure 25 The **Basic Settings** tab*

This tabbed section allows you to specify the following global settings:

Status Select whether to disable or enable a redundancy protocol globally on the switch.

Version Select the protocol version. Either ***RSTP Compatible*** or ***STP Compatible*** can be chosen.

Priority	Specify the STP priority. This is used to identify the root bridge in a spanning tree. The bridge with the lowest value has the highest priority and is the root. A higher numerical value means a lower priority; thus, the highest priority is ***0***. The highest numerical value on the drop-down list is ***61440***.
Max Age	Specify the time in seconds (STP) or hop count (RSTP) that the information received in a RSTP BPDU (bridge protocol data unit) is valid.
Hello Time	Specify the time interval in seconds between two successive configuration BPDUs.
Tx Hold Count	Specify the maximum number of BPDUs that can be transmitted in a second.
Forward Delay	Specify the period of time in seconds that a bridge will wait (the listen and learn period) before beginning to forward data packets.
Dynamic Path Cost Calculation	Select whether the dynamic path cost calculation is allowed or not. Cost calculation is allowed when this is set to ***True***, the pathcost of all the ports will be calculated dynamically based on the speed of the interface.

Note

It is recommended to use RSTP instead of STP to reduce the time for the networkrecovery in case of a link failure.

Note

The parameter Max Age must be set to the worst case diameter within a RSTP topology to prevent loops. In a ring structure of 20 Switches for example, the Max Age value must be set to at least 20.

The following two mathematical relationships must be observed when assigning values for ***Hello Time***, ***Forward Delay*** and ***Max Age*** parameters:

1. (Forward Delay) * 2 >= Max Age
2. Max Age >= 2 * (Hello Time)

8.2 Port Settings tab

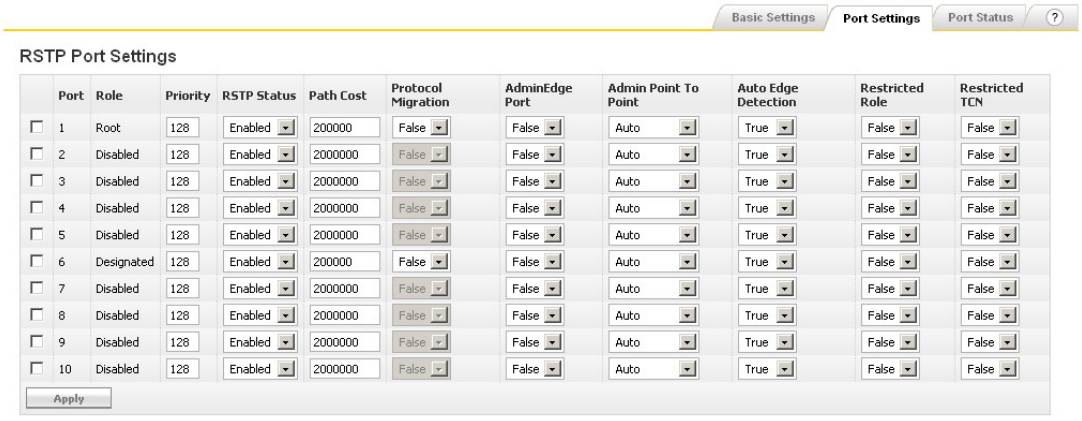
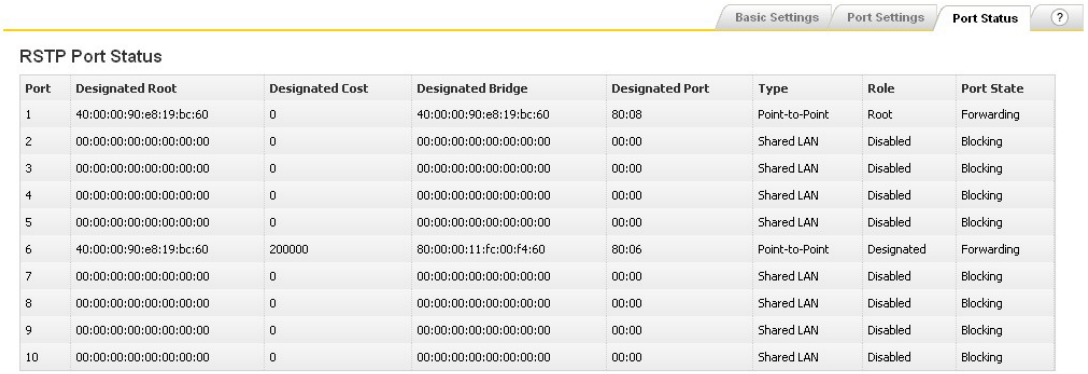

Basic Settings
Port Settings
Port Status
RSTP Port Settings
Port Role Priority RSTP Status Path Cost Protocol Migration AdminEdge Port Admin Point To Point Auto Edge Detection Restricted Role Restricted TCN
1 Root 128 Enabled 200000 False False Auto True False False
2 Disabled 128 Enabled 2000000 False False Auto True False False
3 Disabled 128 Enabled 2000000 False False Auto True False False
4 Disabled 128 Enabled 2000000 False False Auto True False False
5 Disabled 128 Enabled 2000000 False False Auto True False False
6 Designated 128 Enabled 200000 False False Auto True False False
7 Disabled 128 Enabled 2000000 False False Auto True False False
8 Disabled 128 Enabled 2000000 False False Auto True False False
9 Disabled 128 Enabled 2000000 False False Auto True False False
10 Disabled 128 Enabled 2000000 False False Auto True False False
Apply

*Figure 26 The **Port Settings** tab*

This tabbed section allows you to specify per-port STP settings. Changes can be made under the following columns:

Port	Select the port that you would like to change by clicking on the checkbox here.
Role	Displays the current role of the port. During the calculation of the spanning tree topology, each port is assigned a port role (root, designated, backup, alternate or disabled) based on how it will participate in the tree topology.
Priority	Specify the RSTP port priority. This is the value of the priority field located in the first octet of the port ID.
RSTP Status	Select ***Enabled*** or ***Disabled*** to enable or disable RSTP for the corresponding port.
Path Cost	Specify the path cost associated with this port. STP associates a path cost value to each port on each bridge. This value is an adjustable weighted measure that indicates the port's contribution to the route's transmission speed. Higher numerical costs indicate slower paths.
Protocol Migration	When operating in RSTP mode, writing ***True*** to this object forces this port to transmit RSTP BPDUs. Any other operation on this object has no effect anit always returns ***False*** when read.
AdminEdge Port	Select ***True*** if the port is acting as an edge port.
Admin Point to Point	Select the ***Force True*** option to configure a port as point-to-point. The port can be forced to a non-point-to-point state by selecting ***Force False***. If you select ***Auto***, the decision is made dynamically (from the AL or MAC layer).
Auto Edge Detection	Select ***True*** if you want to have the edge port status calculated dynamically.
Restricted Role	Select the restricted role status of the port. If set to ***True***, the port is restricted so that it may not be selected as a root port. A restricted port can be selected as an alternate port after the root port has been chosen. A ***True*** setting can result in poor connectivity within the spanning tree. The default setting is ***False***.
Restricted TCN	Select the restricted TCN (Topology Change Notification) status of the port. If set to ***True***, the port does not propagate received topology change notifications or topology changes to other ports. This parameter is set to ***False*** by default. Prevents the Topology change caused by that port.

8.3 Port Status tab



Port	Designated Root	Designated Cost	Designated Bridge	Designated Port	Type	Role	Port State
1	40:00:00:90:e8:19:bc:60	0	40:00:00:90:e8:19:bc:60	80:08	Point-to-Point	Root	Forwarding
2	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
3	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
4	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
5	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
6	40:00:00:90:e8:19:bc:60	200000	80:00:00:11:fc:00:f4:60	80:06	Point-to-Point	Designated	Forwarding
7	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
8	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
9	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking
10	00:00:00:00:00:00:00:00	0	00:00:00:00:00:00:00:00	00:00	Shared LAN	Disabled	Blocking

*Figure 27 The **Port Status** tab*

This tabbed section allows you to view the status of each port; no settings can be specified or changed here. The following status information is shown:

Designated Root Displays the unique bridge identifier (same as the MAC address) of the bridge recorded as the root for the segment to which the port is attached.

Designated Cost Displays the path cost of the designated port of the segment connected to this port.

Designated Bridge Displays the designated bridge identifier (MAC address) of the bridge. This is the preferred bridge which this port considers as the designated bridge for its segment.

Designated Port Displays the number of the port on the designated bridge for this port's segment.

Type Displays the operation status of the LAN segment attached to this port. This indicates whether a port is considered to have a point-to-point connection or shared media.

Role Displays the port's current role as defined by the Spanning Tree Protocol (root, designated, backup, alternate or disabled).

Port State Displays the port's current state (***Forwarding***, ***Blocking***, ***Disabled*** or ***Learning***) as dynamically determined by STP.

8.4 Examples for a STP/RSTP application

8.4.1 Example 1: Loop detection by the STP/RSTP

In the topology shown in the figure, frame duplication happens because of the manner in which the switches 2 and 3 are interconnected. Listed below are two different scenarios in which frame duplication happens:

When Host1 sends a packet to Host3, switch 1 receives the packet on Port1 and forwards it on to Port2 (LAN B). This packet is received by both the switches - 2 and 3, and both of them forward the packets towards LAN A. Thus, Host3 receives two copies of the same packet, instead of one.

When Host1 sends a broadcast packet, the packet travels in an infinite loop between the two switches 2 and 3. Switch 2 receives the packet from LANB and forwards it to LANC, which is

again received by Switch 2 and forwarded to LANB. This repeats continuously. The STP detects the loop between the two switches and disables Port1 of switch 2, thus effectively breaking the loop.

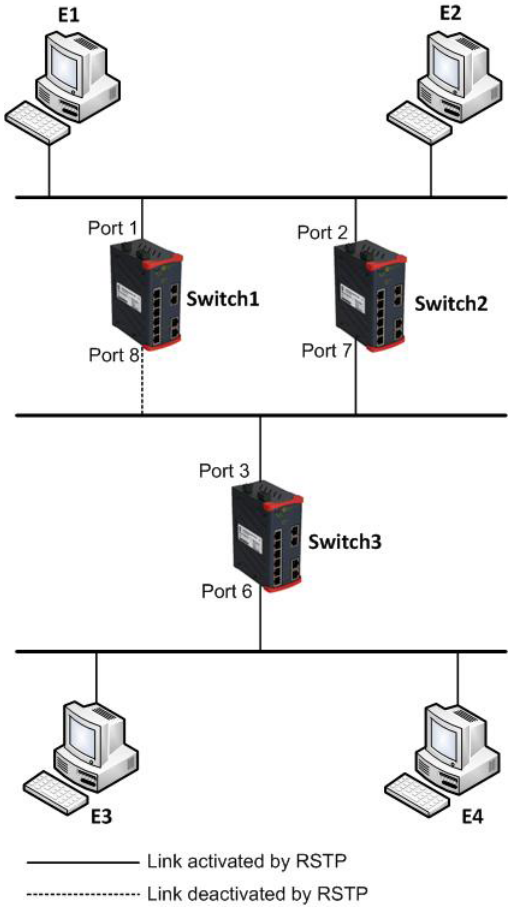


Figure 28 Loop detection by the STP/RSTP

8.4.2 Example 2: Benefits of RSTP

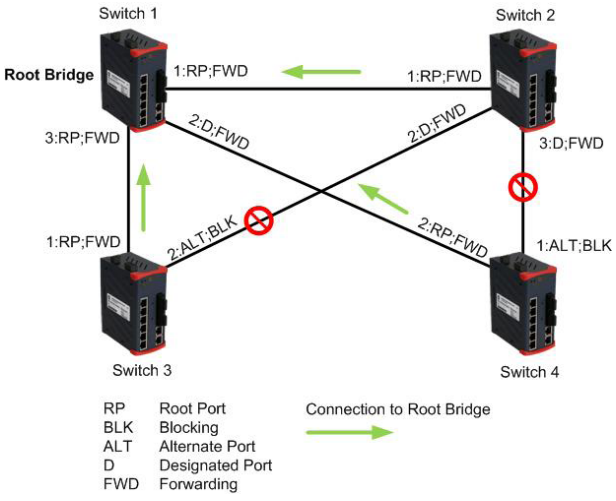


Figure 29 Benefits of RSTP

As shown in figure above, if the root port on a switch becomes unavailable, RSTP immediately brings the alternate port to forwarding.

Generally, if port 1 on Switch 3 becomes unavailable, [in standard STP (802.1D), if the root port becomes unavailable], the switch must go through the listening and learning states on the alternate port to re-converge with the spanning tree. Thus, port 2 of Switch 3 must go through the listening and learning states before entering the forwarding state and re-converging with the spanning tree.

In this scenario, RSTP avoids this delay by calculating an alternate root port, and immediately switching over to the alternate port if the root port becomes unavailable. The alternate port remains in the blocking state as long as the root port is in the forwarding state, but moves immediately to the active state if the root port becomes unavailable. Thus, using RSTP, Switch 3 immediately brings port 2 to forwarding, without the delays caused by the listening and learning states. RSTP selects the port with the next best cost to the root bridge.RSTP directly makes the edge ports as forwarding instead of moving in steps from blocking/listening (discarding) to learning and then to forwarding state.

9. The VLAN Section

VLANs (Virtual LANs, Virtual Local Area Networks) can be viewed as a group of devices on different physical LAN segments which can communicate with each other as if they were all on the same physical LAN segment, that is, a network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN. VLANs are configured through software rather than hardware, which makes them extremely flexible.

VLAN provides the following benefits for switched LANs:

- Improved administration efficiency
- Optimized Broadcast/Multicast Activity
- Enhanced network security

This switch supports port-based VLANs (Virtual Local Area Networks) in compliance with IEEE 802.1Q. Initially, all ports on the switch are assigned to the configured default VLAN 1. Additional VLANs can be created on the switch and ports can be assigned to the new VLANs. This allows traffic from devices connected to these ports to bridge within their VLAN domains.

The VLAN window is divided into four tabbed sub-sections: ***Basic Settings***, ***Port Settings*** and ***Static VLAN***. Each of these sections is described below.

9.1 Basic Settings tab

*Figure 30 The **VLAN Basic Settings** tab*

This tabbed section displays VLAN global configuration settings.

Learning Mode Select the VLAN learning mode. You can enable either ***IVL*** (independent), ***SVL*** (shared) or hybrid. This determines the access method to the VLAN filtering database.

In IVL, the information learnt by one VLAN is never used by other VLANs in making forwarding decisions. As a result of this, there are separate filtering databases maintained for each VLAN. The advantage in using IVL is that security restrictions can be applied to prevent unauthorized users from learning the sources of data traffic. This mode is typically employed in situations where,

a. End stations operate over multiple VLANs with the same MAC address.
b. Learning database size is not a constraint.

In SVL, a global address table is used for all VLANs combined.

Port Based on All Ports Select per-port protocol-based classifications to be either enabled or disabled.

Maximum VLAN ID Displays the largest valid VLAN ID that the switch allows.

Maximum Support VLANS	displays the maximum number of VLANs that this switch can support.
Number of VLANs in the System	displays the active number of VLANs currently configured on the switch.

9.2 Port Settings tab

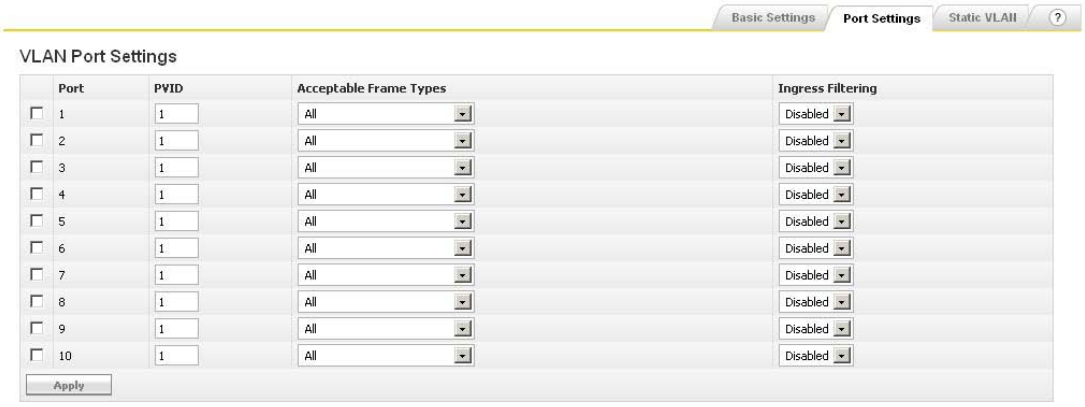


*Figure 31 The **VLAN Port Settings** tab*

This tabbed section allows you to specify the following port settings:

Select/Port	Select the port that you would like to change by clicking on the radio button here.
PVID	Specify a port default VLAN ID (PVID) for the port for port-based VLAN classification. This is the VLAN ID which will be assigned to all untagged frames received on the port. The possible values are 1 to 4094. VLANs are created and assigned ports exclusively in the ***Static VLAN*** tab.
Acceptable Frame Types	Select the frame types accepted (accept only tagged frames, untagged and priority tagged frames or all frames).
Ingress Filtering	Select if ingress (incoming) filtering is enabled or disabled at the port level. If filtering is enabled, incoming frames are discarded if they are tagged for VLANs which do not include this particular ingress port in their member set. If filtering is disabled, incoming frames are discarded if they are tagged for VLANs which are not configured on the switch.

9.3 Static VLAN tab

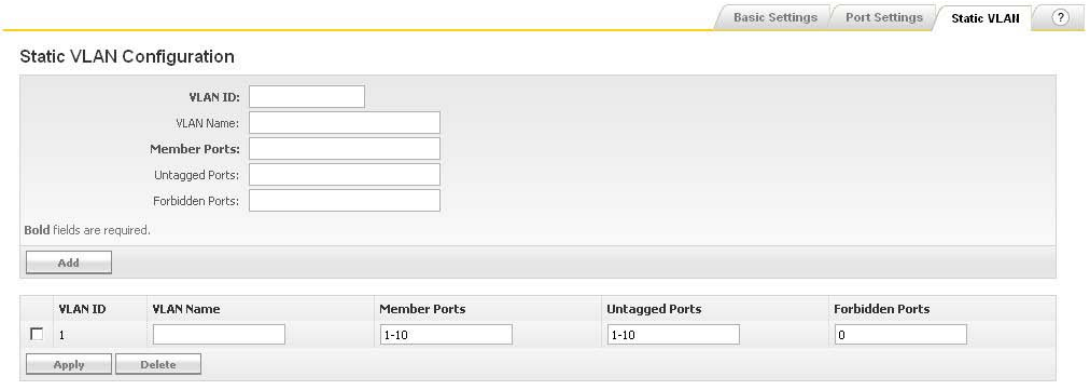


*Figure 32 The **Static VLAN** tab*

This tabbed section displays the available VLANs and allows you to create new VLANs.

VLAN ID	Here you can create a new VLAN with the specified VLAN ID. Note that an existing default VLAN which includes all ports is labelled with VLAN ID 1. The possible values are ***1*** to ***4094***.
VLAN Name	Specify a user-defined name, usually used to remember the purpose of the VLAN.
Member Ports	Specify the ports that belong to the VLAN that you are creating.
Untagged Ports	Specify ports which forward packets untagged.
Forbidden Ports	Specify ports which may not be included in the VLAN.

At the bottom of this section, a list displays all existing VLANs along with the user-defined information above. The values in this table can be changed to alter the properties of existing VLANs (the name, member ports, untagged ports or forbidden ports).

9.4 Examples for a VLAN applications

9.4.1 Example 1: VLANS with all VLAN-Aware Switches

In the figure below, the Hosts E1, E2 and E3 are grouped to form the VLAN 2, while the Hosts E4 and E5 are grouped to form the VLAN 3. Any multicast/broadcast traffic from Host E1 is sent to Switch 2 by Switch 1. Switch 2 then forwards the traffic to Hosts E2 and Switch 3. Switch 3 forwards the received traffic to Hosts and E3. At no given point of time will the traffic from Host E1 be transmitted to Hosts E4 and E5.

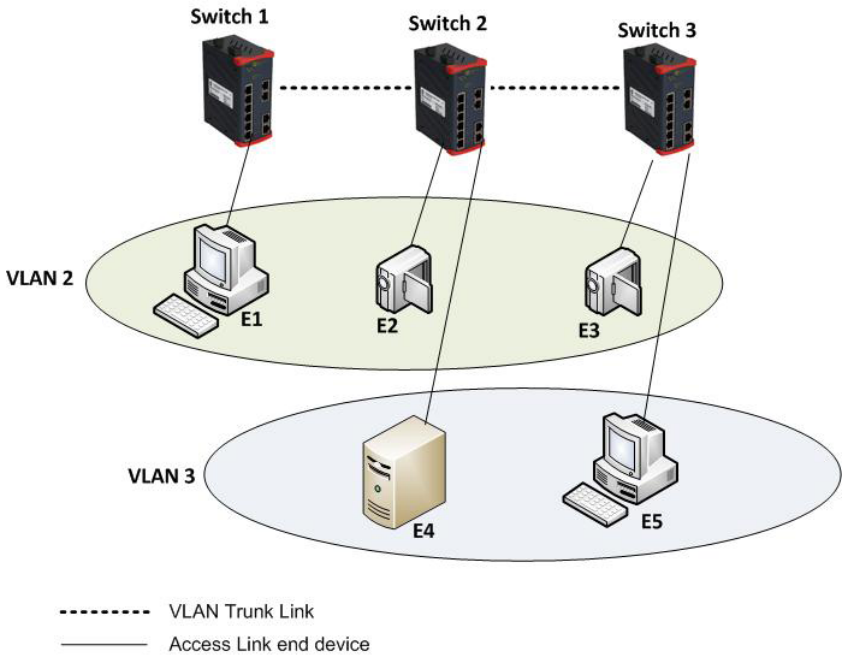


Figure 33 VLANS with all VLAN-Aware Switches

9.4.2 Example 2.1: VLANs with VLAN-Aware and VLAN-Unaware Switches

In VLAN-aware switches group the end nodes into three VLANs 2, 3 and 4. VLAN 4 is untagged, i.e., all members of the VLAN are VLAN-unaware. These VLANs span multiple switches. Note that the end node ‘E7’ in VLAN 4 is not connected to a VLAN-aware switch directly. It is connected to the VLAN-unaware switch uSwitch1 (unmanaged Switch). VLAN-aware switches need to untag frames before forwarding them to VLAN-unaware devices. Therefore, Switch2 and Switch3 transmit untagged frames for VLAN 4, but transmit tagged frames for other VLANs. This behavior allows the end node E7 to participate in VLAN configuration even though it is connected to a VLAN-unaware bridge. The ports that transmit both tagged and untagged frames are called hybrid ports. The Frames forwarded by VLAN-aware switches on a given port must be either tagged or untagged for a given VLAN.

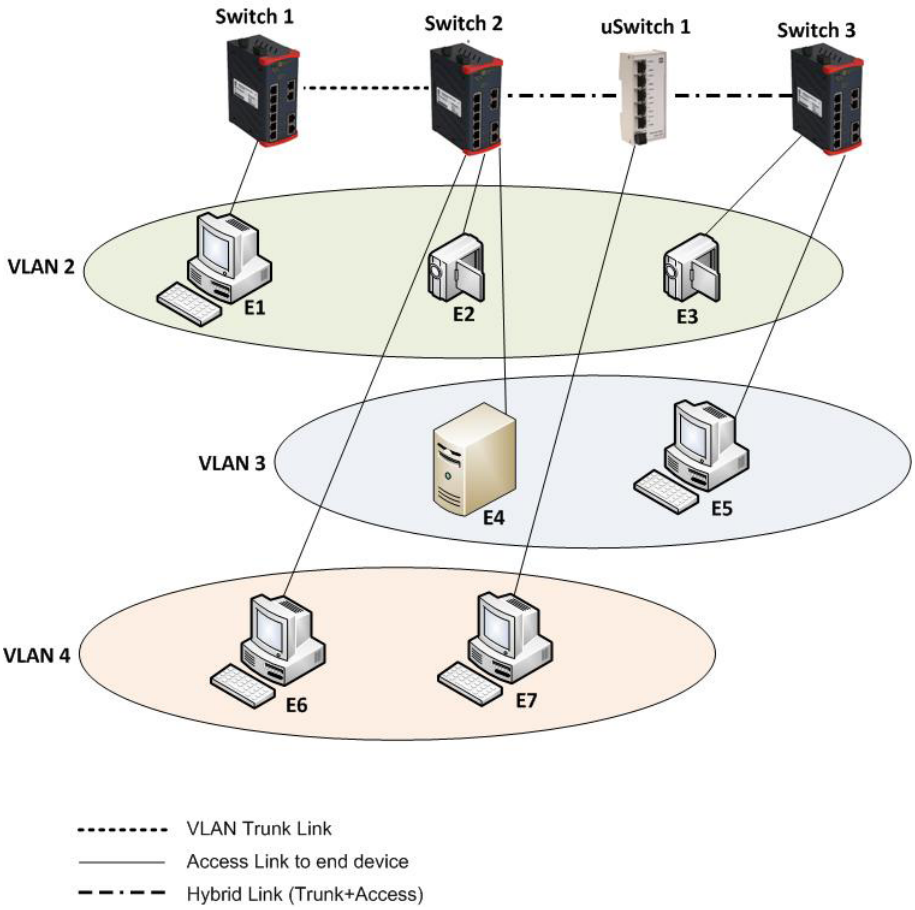


Figure 34 VLANs with VLAN-Aware and VLAN-Unaware Switches

9.4.3 Example 2.2: Tagging and Untagging frames in the switch

Segmenting bridged LANs into VLANs reduces the broadcast domain. Broadcast frames/ Multicast and unknown unicast frames belonging to a VLAN are forwarded only on the ports where the VLAN members are reachable. For example Switch1 forwards the broadcast traffic sent by Host E1 only on the port that is connected to the VLAN Bridge Switch2. If the switch Switch1 had been VLAN unaware, then the broadcast traffic would have been flooded on all of its ports. In Switch2, the default VLAN ID for the port that is connected to uSwitch1, must be configured to VLAN Z. The traffic sent by Host E7 is forwarded to Switch2 by uSwitch1. As a result of configuration in Switch2, the traffic is associated to VLAN 4 and is forwarded to Host E6 by Switch2.

9.4.4 Example 3: VLANs Over Switches with Multiple VLAN Trunks

In the figure below, the RSTP protocol disables one of the VLAN trunk links to form a loop free topology and enables the disabled trunk link whenever the currently enabled trunk link fails. All VLAN configuration must be done for both ports to guarantee a stable network recovery in case of a link failure on one of the VLAN trunk links.

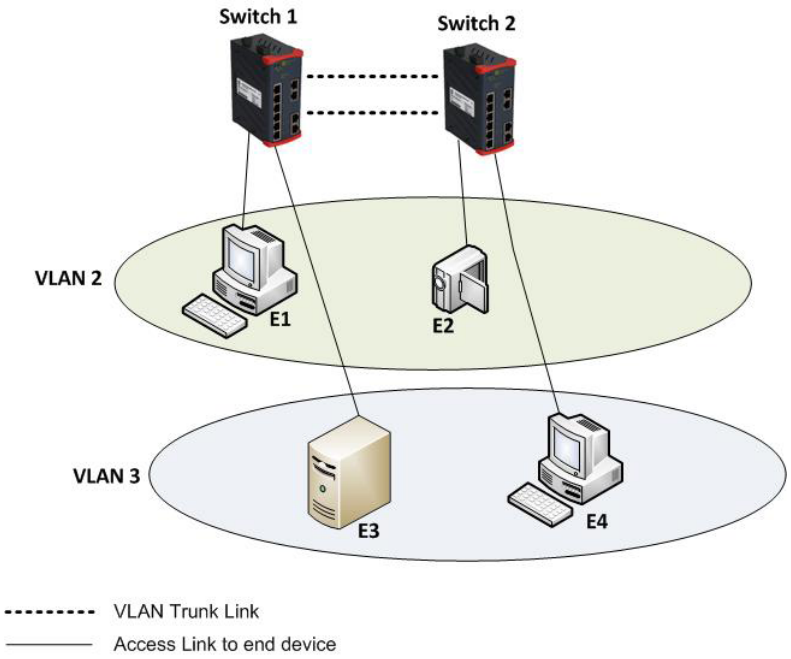


Figure 35 VLANs Over Switches with Multiple VLAN Trunks

10. Rate Limiting

The Rate Control feature protects the switch from packet flooding from malicious users. Traffic that exceeds a configured threshold traffic rate must be dropped. Rate control can be applied on unknown Unicast, Multicast and Broadcast traffic. By applying rate control on Broadcast Traffic, Broadcast Storm can be prevented. The threshold and the type of packet which should be filtered can be set separated for each port of the switch.

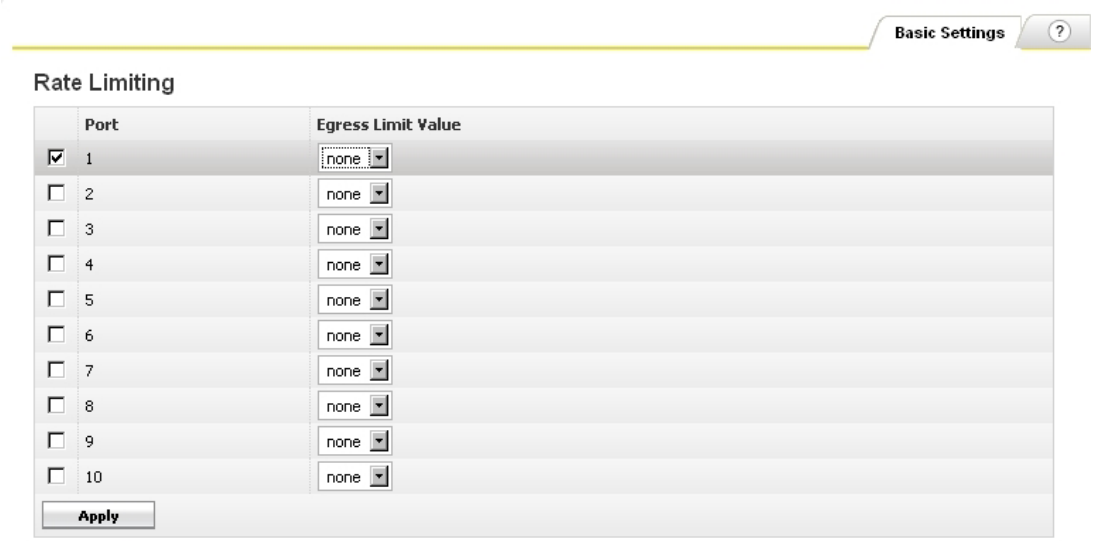


Figure 36 Rate Control

Egress Limit Value Select the bandwidth limit for the outgoing traffic on this port. The possible values are
1 Mbit/s / 2 Mbit/s / 4 Mbit/s / 8 Mbit/s / 16 Mbit/s / 32 Mbit/s / 64 Mbit/s

11. Port based network access control IEEE 802.1x

The Port based Network Access Control (PNAC) is based on the IEEE 802.1X standard. It provides a means of authenticating and authorizing devices attached to a switch port. It prevents access to a port in cases when the authentication and authorization fails. The entity that facilitates authentication of other entities attached to it is called an Authenticator. The entity that is being authenticated by an Authenticator attached to the other end is called a Supplicant. Authentication, Authorization and Accounting for a user session with the remote Server, is done by RADIUS. The switch acts as a RADIUS client. It encapsulates the accounting information passed by the User in the required format and sends the packet to the designated RADIUS accounting server.

11.1 Basic settings tab

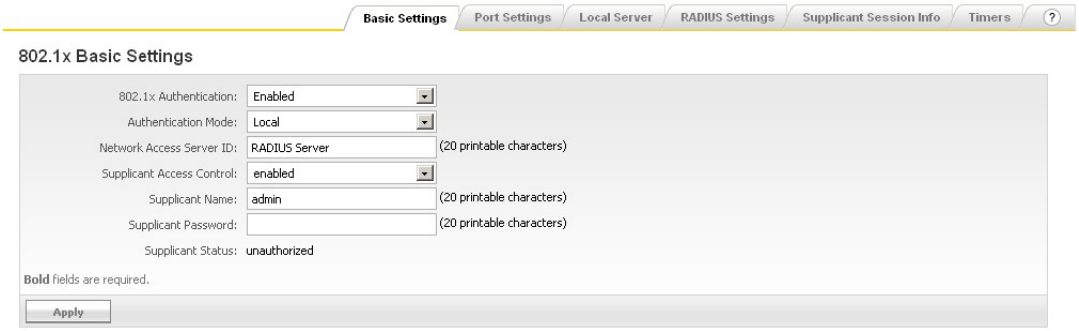


*Figure 37 The **Basic Settings** tab*

The 802.1x Basic Settings page allows you to configure the basic settings of 802.1x.

Function	Description
802.1xAuthentication	Specifies the status of 802.1x based port security feature in the switch. Options are: *Enable* – Enables 802.1x based port security feature in the switch. *Disable* – Disables 802.1x based port security feature in the switch. **Range of value:** *Enable* / *Disable* **Default value:** *Disable*
Authentication Mode	Specifies the Authentication Server Location. **Range of value:** *Local* / *Remote* **Default value:** *Local*
Network Access Server ID	Specifies the Authenticator ID, which originates the Access-Request Packets. **Range of value:** Not more than 20 printable characters. **Default value:** none
Supplicant Name	**Range of value:** Not more than 20 printable characters. **Default value:** *admin*
Supplicant Password	**Range of value:** Not more than 20 printable characters. **Default value:** *harting*

11.2 Port settings tab

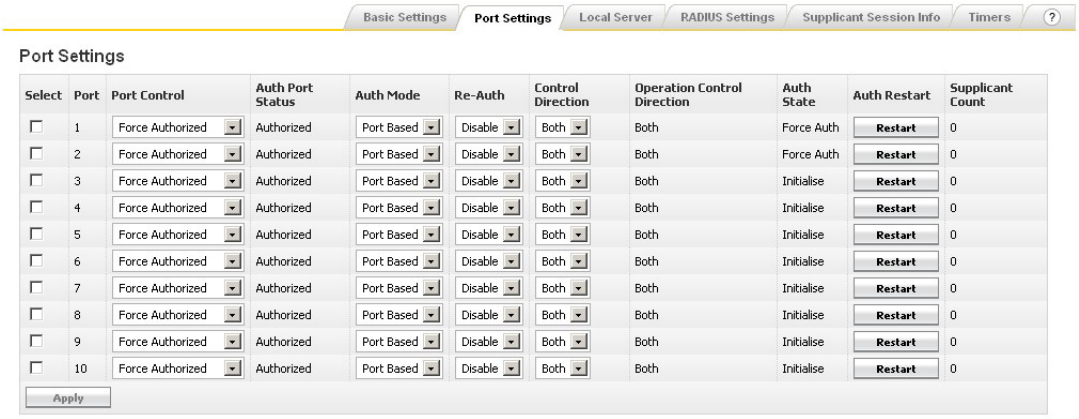


*Figure 38 The **Port Settings** tab*

The 802.1x Port Settings page allows you to configure the security information at the individual port levels.

Function	Description
Port Control	Specifies the control values of the Authenticator Port. Options are: *ForceAuthorized* – Allows all the traffic through this port. *ForceUnauthorized* – Blocks all the traffic through this port. *Auto* – Imposes 802.1x authentication process in this port. **Range of value:** *ForceAuthorized* / *ForceUnauthorized* / *Auto* **Default value:** *ForceAuthorized*
Auth. Port Status	Shows the current status of the Authenticator Port. **Range of value:** *Authorized* / *Unauthorized*
Auth. Mode	Specifies the configuration for selecting the authentication mode. **Range of value:** *Port Based* / *Mac Based* **Default value:** *Port Based*
Control Direction	Specifies the current value of the administrative controlled directions parameter for the port. **Range of value:** *Both* / *In* **Default value:** *Both*
Auth. State	Shows the current status of the Authenticator Port. **Range of value:** *Authorized* / *Unauthorized*
Auth. Restart	Restart Authentication Specifies the initialization control for the port to restart authentication.
Re-Auth.	Reauth enables / disables re-authentication mechanism on the port. **Range of value:** *Enable* / *Disable* **Default value:** *Disable*
Suplicant Count	Number of Supplicants authorized on the switch.

11.3 Local server tab

*Figure 39 The **Local Server** tab*

The Local Authentication Server Configuration page allows you to configure the Local Authentication Server information.

Function	Description
User Name	Specifies the identity of the user, seeking authentication. **Range of value:** Not more than 20 printable characters. **Default value:** none
Password	Specifies the password specific to the user name. **Range of value:** Not more than 20 printable characters. **Default value:** none
Port List	Represents the complete set of ports of the authenticator to which the user is Allowed. **Default value:** *All*

11.4 RADIUS server tab

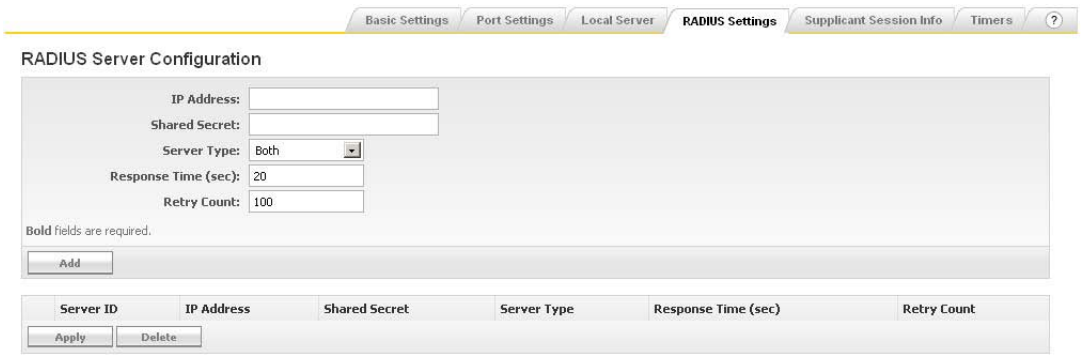


*Figure 40 The **RADIUS Settings** tab*

The Radius Server Configuration page allows you to configure the Radius Server information.

Function	Description
IP Address	Specifies the IP Address of the Radius Server.

Shared Secret	Specifies the secret string, which is to be shared between the Radius Server and the Radius Client. **Range of value:** Not more than 20 printable characters. **Default value:** none
Server Type	Specifies the RADIUS server type **Range of value:** *Authenticating* / *Accounting* / *Both* **Default value:** *Both*
Response Time	Specifies the maximum time within which the Radius Server has to respond for a request from the Radius Client. **Range of value:** *1 ... 120 sec* **Default value:** *20*
Retry Count	Specifies the maximum number of times a radius request is to be re-transmitted before getting response from the Radius Server. **Range of value:** *1 ... 254 sec* **Default value:** *100*

11.5 Supplicant session info tab

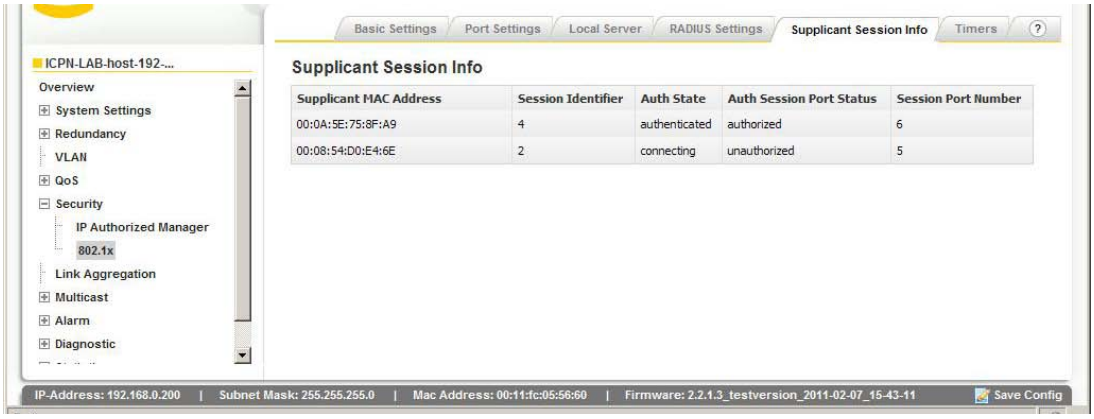


*Figure 41 The **Supplicant Session Info** tab*

The Supplicant session info page displays the Supplicant Session information details.

Function	Description
Supplicant MacAddr	Specifies the Supplicant MAC Address.
Session Identifier	Specifies the Session Identifier of the supplicant.
AuthSM State	Specifies the state of the Authenticator State Machine.
Auth Session Status	Specifies the Authentication Session Status.
Session PortNumber	Specifies the port number through which a particular Session MAC address is learnt.

11.6 Timers tab

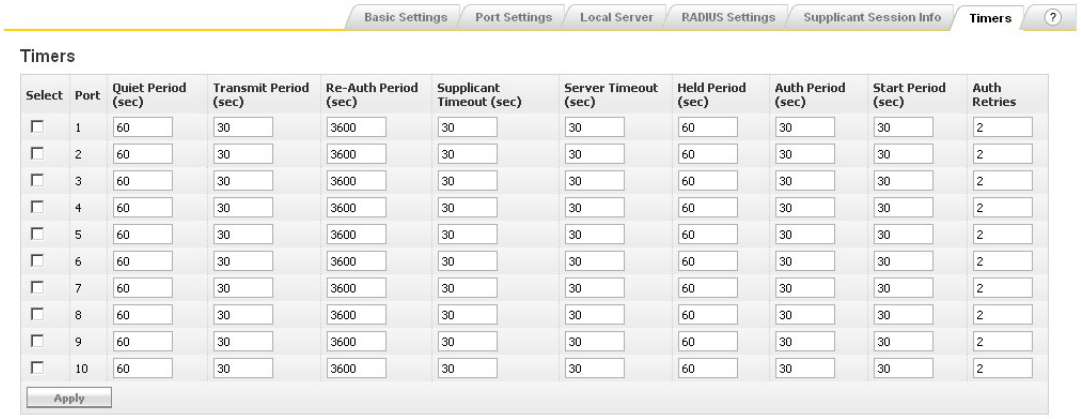

Basic Settings
Port Settings
Local Server
RADIUS Settings
Supplicant Session Info
Timers
Timers
Select
Port
Quiet Period (sec)
Transmit Period (sec)
Re-Auth Period (sec)
Supplicant Timeout (sec)
Server Timeout (sec)
Held Period (sec)
Auth Period (sec)
Start Period (sec)
Auth Retries
1 60 30 3600 30 30 60 30 30 2
2 60 30 3600 30 30 60 30 30 2
3 60 30 3600 30 30 60 30 30 2
4 60 30 3600 30 30 60 30 30 2
5 60 30 3600 30 30 60 30 30 2
6 60 30 3600 30 30 60 30 30 2
7 60 30 3600 30 30 60 30 30 2
8 60 30 3600 30 30 60 30 30 2
9 60 30 3600 30 30 60 30 30 2
10 60 30 3600 30 30 60 30 30 2
Apply

*Figure 42 The **Timers** tab*

The 802.1x Timer Configuration page allows you to configure the *Timer* parameters at the individual port level.

Function	Description
Quiet Period	Specifies the duration for which the authenticator will be silent and will not attempt to acquire a supplicant. **Range of value:** *0 ... 65 535 sec* **Default value:** *60 sec*
Transmit Period	Specifies the Time Period used by the Authenticator State machine to define when the EAPOL PDU is to be transmitted. **Range of value:** *1 ... 65 535 sec* **Default value:** *30 sec*
Re-Auth. Period	Specifies the time between periodic re-authentication of the supplicant. **Range of value:** *1 ... 65 535 sec* **Default value:** *3600 sec*
Supplicant Timeout	Specifies the amount of time the switch waits for a response before retransmitting the request to the client, when relaying a request from the authentication server to the client. **Range of value:** *1 ... 65 535 sec* **Default value:** *30 sec*
Server Timeout	Specifies the amount of time the switch waits for a reply before retransmitting the response to the server, when relaying a response from the client to the authentication server. **Range of value:** *1 ... 65 535 sec* **Default value:** *30 sec*
Held Period	Specifies the amount of time the client will wait before re-attempting a failed 802.1X authentication. **Range of value:** *1 ... 65 535 sec* **Default value:** *60 sec*

Auth Period

Specifies the time interval for resending 802.1X request messages after not receiving a response.

Range of value: *1 ... 65 535 sec*
Default value: *30 sec*

Start Period

Specifies the time interval for resending Start messages.

Range of value: *1 ... 65 535 sec*
Default value: *30 sec*

Auth. Retries

Number of times the switch sends an EAP-request/identity frame before restarting the authentication process

Range of value: *1 ... 10*
Default value: *2*

12. The IP Authorized Manager

This section allows you to define an incoming IP address that is allowed access to the switch (thus functioning as an IP-based access control list). This rule also restrict which SNMP managers can access the switch MIB. The access control list of user-defined IP address is then displayed at the bottom of this section.

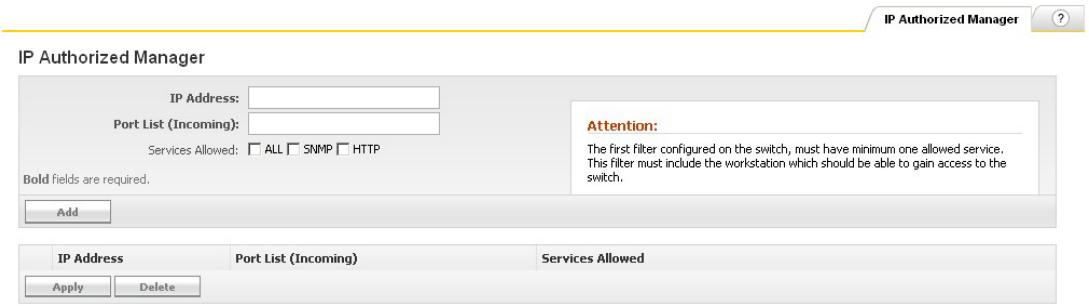


Figure 43 The IP Authorized Manager

IP Address Specify IP addresses that you wish to allow to gain access to the switch configuration. This IP address has to be an address of an existing device and no subnet or network address. All addresses which are not entered to the authorization list will be blocked.

Port List Specify the port numbers (i.e. 3-7,9) which will be controlled by the rule. At least one port must be specified.

Services Allowed Specify which services should be allowed or denied. If you are creating a Deny rule, no boxes should be checked.

The access control list is displayed at the bottom of the page. Incoming packets are then checked against this list and the first applicable rule is applied.

Note

Do not use a subnet or network address. Only Host IP addresses are allowed!

ATTENTION

The first filter must include the workstation which is being used to gain access to the switch. If you accidentally create a Deny rule that locks you out of the switch, it is sufficient to reboot the switch to revert back to the last set of functional filter rules.

Example

Alow the access to the switch for one single station

Source IP of the station which should access the switch:	192.168.5.101
Authorized Manager IP entered at the Authorized Manager:	192.168.5.101

13. The Multicast IGMP Section

The IGMP Snooping feature in helps the switch to control IPv4 multicast traffic in a switched network. A Layer 2 switch by default, floods multicast traffic within the broadcast domain. This can consume a lot of bandwidth if many multicast servers are sending streams of data. IGMP Snooping are meant to dynamically discover the presence of multicast receivers and use the learnt information to control the multicast traffic flow, restricting it only to the desired ports on which receivers are present.

The IGMP Snooping Switch examines or "snoops" IGMP packets sent between the hosts and the "router" (Multicastsource) and learns the Multicast Group membership of the hosts. The Ha-VIS FTS Ethernet Switch learns the multicast forwarding information through the IGMP report messages from hosts and updates the Forwarding database. It also learns the router ports through the multicast control messages from the routers or Querier-Switch. The IGMP Snooping switch forwards multicast data traffic over a particular port only if one host at least has joined that particular multicast group that is reachable on that port. HARTING provides support for dynamic multicast registration support through IGMP snooping (for IPv4 multicast traffic). IGMP snooping can be used for Layer 2/3 traffic and provides a much greater degree of granularity in selecting multicast traffic. It is possible to edit and add information to the forwarding database manually, so there is no limitation and restriction for the network topology and the application.

This section allows you to enable and configure the switch's IGMP (Internet Group Management Protocol) snooping capabilities. IGMP snooping can be used to limit high-bandwidth tasks to their intended targets without flooding the entire LAN.

The following tabbed sections are available:

13.1 Basic Settings tab

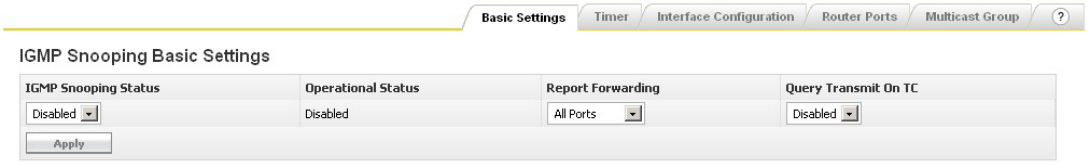


*Figure 44 The **Basic Settings** tab*

IGMP Snooping Status Select ***Enabled*** to enable IGMP snooping globally throughout this switch. If this setting is disabled, no interface configuration is possible.

Operational Status Displays the global status of IGMP snooping on the switch. You can click on the tabbed header ***Basic Settings*** at the top to refresh the display.

Report Forwarding Select whether the IGMP reports are forwarded on all ports or only on router ports.

Query Transmit on TC Select ***Enabled*** or ***Disabled*** to specify whether IGMP snooping queries are transmitted after a topology change. ***Enabled*** activates query transmissions.

13.2 Timer tab

*Figure 45 The **IGMP Timer** tab*

Router Port Purge Interval — Specify the interval (in seconds) at which the learnt router port will be purged. The valid range is from 60 to 600 seconds. The default value is ***125 seconds***.

Group Member Port Purge Interval — Specify the interval (in seconds) after which a port is deleted if no IGMP reports are received on that port. The valid range is from 130 to 1225 seconds. The default value is ***260 seconds***.

Report Forward Interval — Specify the forwarding interval (in seconds) before which the next report messages for the same multicast group will not be forwarded. The valid range is from 1 to 25 seconds. The default value is ***5 seconds***.

Group Query Interval — Specify the interval (in seconds) after which the switch sends a group-specific query on a port when an IGMPv2 leave message is received. The valid range is from 2 to 5 seconds. The default value is ***2 seconds***.

13.3 Interface Configuration tab

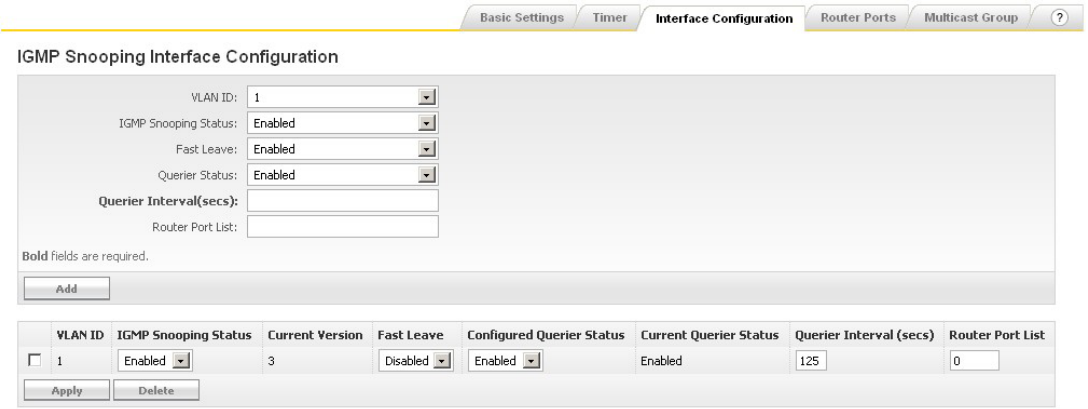


*Figure 46 The **Interface Configuration** tab*

This tabbed section allows you to define a specific IGMP snooping configuration for the switch. The bottom of this section displays the list of IGMP-enabled VLANs which have already been configured. The following parameters can be specified when snooping is globally enabled in the ***Basic Settings*** tab:

VLAN ID	Select from the list of configured VLANs to specify the VLAN to which the configuration will apply.
IGMP Snooping Status	Select to enable or disable snooping on the specific VLAN. You can disable snooping for a specific VLAN even if snooping in enabled globally in the *Basic Settings* tab.
Fast Leave	Select whether the fast leave processing should be enabled or disabled on the specified VLAN.
Querier Status	Select whether the IGMP snooping switch should be enabled or disabled as a querier on a specific VLAN.
Querier Interval	Specify the interval (in seconds) used to send general queries by the switch when it is configured as a querier. The valid range is from 60 to 600 seconds.
Router Port List	Specify the router ports on the specified VLAN. All ports in VLAN 1 may be on this list (by default VLAN 1 includes all ports).

Note

The bottom of this section displays the list of IGMP-enabled VLANs which have already been configured. Changes can also be made to the list in order to modify pre-existing IGMP profiles.

13.4 Router Ports tab

*Figure 47 The **Router Ports** tab*

This tabbed section displays a table showing which ports (in column 2) belong to IGMP-enabled VLANs (in column 1).

13.5 Multicast Group

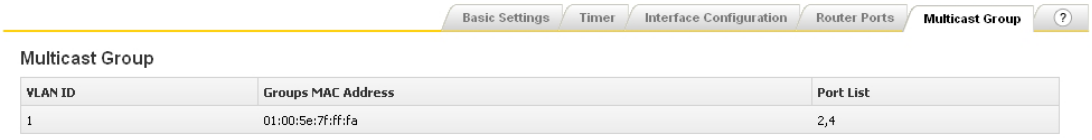


*Figure 48 The **Multicast Group** tab*

This table displays all current multicast streams active on the switch. The VLAN ID, MAC address and port list are shown for the multicast VLAN.

14. The Alarm Section

Certain network or switch events may require the attention of service personnel. In this section it is possible to specify certain events that should trigger an alert to be sent out.

The ***Alarm*** section is divided into the ***E-mail Alert*** and ***SNMP Alert*** sub-sections.

14.1 E-mail Alert

This section allows you to create two distinct e-mail alert profiles; these profiles are maintained in the ***Alarm 1*** and ***Alarm 2*** tabs.

14.2.1 Alarm 1 and Alarm 2 tabs

Two separate alarm profiles can be set up under these tabs. You must select which of the profiles to activate by clicking on one or both of the ***Active*** boxes at the top of these tabs.

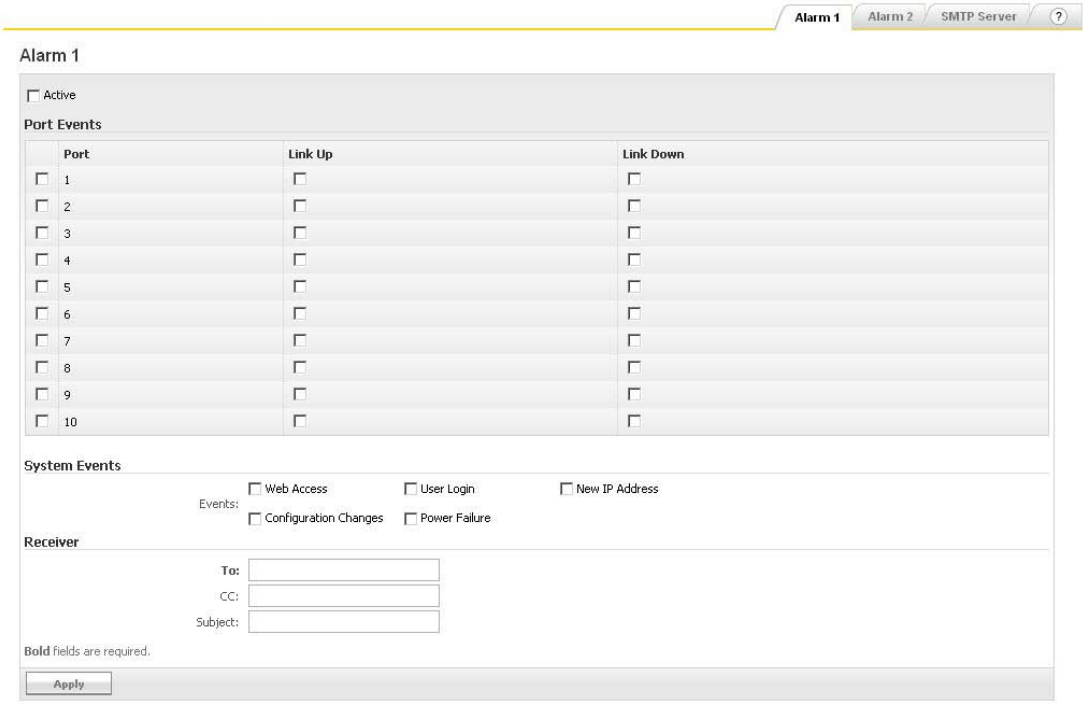


*Figure 49 The **E-mail Alarm** tab*

Link Up / Link Down — Specify, on a per-port basis, if an e-mail is sent when a link is brought up or down by checking one or both of the ***Link Up*** and ***Link Down*** boxes.

System Events — Check a box next to the appropriate event: user login, configuration changes, new IP address and power failure. If a checked event takes place, it will trigger an e-mail alert.

Receiver — Specify the ***To:***, ***CC:*** and ***Subject:*** fields for the alert e-mail. The SMTP server information must also be correctly specified in the next tab in order to send e-mail from the switch.

14.2.2 SMTP Server tab

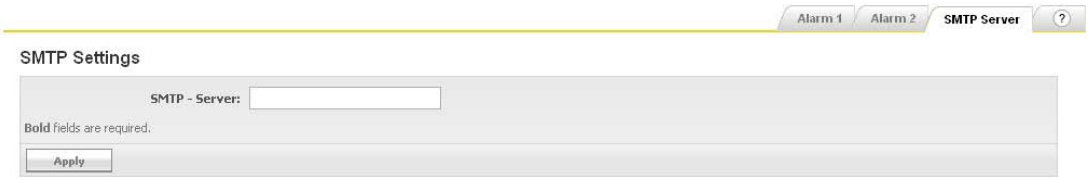


*Figure 50 The **SMTP Server** tab*

This tabbed section allows you to specify the IP address for your SMTP server here. Do not specify the server's fully-qualified domain name.

14.3 SNMP Alert

Two separate SNMP traps can be set up under these tabs. You must select which profiles should be activated by clicking on one or both of the *Active* boxes at the top of these tabs. Be sure to remember to click on the *Apply* button after activating one of the trap profiles.

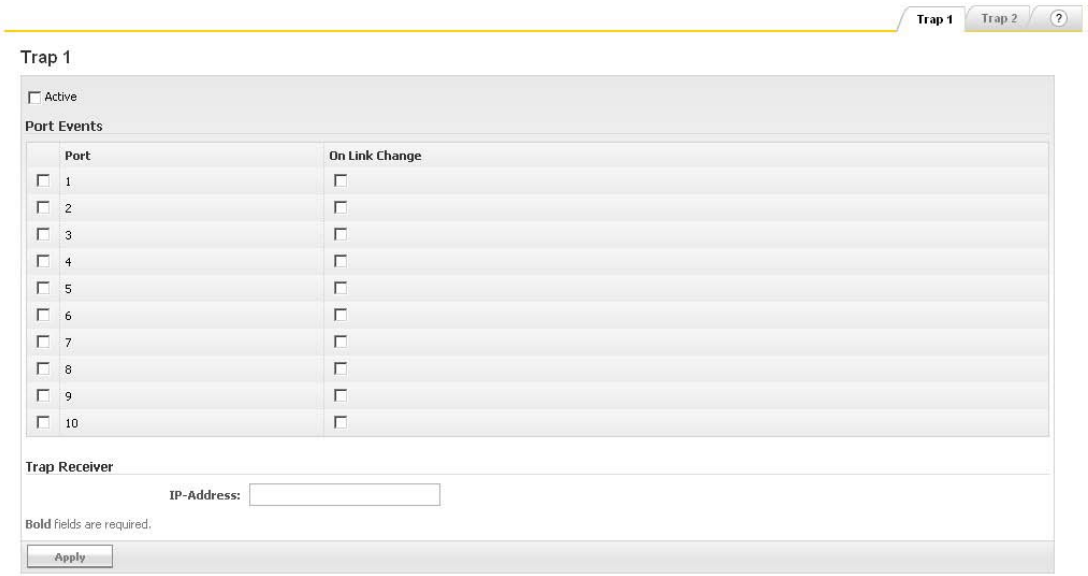


*Figure 51 The **SNMP Trap 1** section*

On Link Change Check this box in order to trigger an SNMP alert for the corresponding port number when the link is brought up or down. If the *Active* box is checked, then a link change on the port will trigger a trap being sent to the receiver.

Trap Receiver 1/2 Specify the IP address of an external SNMP manager that will act as the trap receiver here. This field is required.

15. The Diagnostic Section

This section allows you to enable and view diagnostic information. Additional diagnostic information can be obtained from the power, fault and port LEDs on the switch. Refer to the Installation Notes for more details on the LEDs. The three diagnostic sections – ***Port Mirroring***, ***Switch History***, ***Mac Address Table*** and ***Ping*** – are described below.

15.1 Port Mirroring

In this tabbed section, settings are made that determine if the data traffic at a port should be mirrored to a second port for evaluation purposes. The mirrored information can then be evaluated by a network analyser.

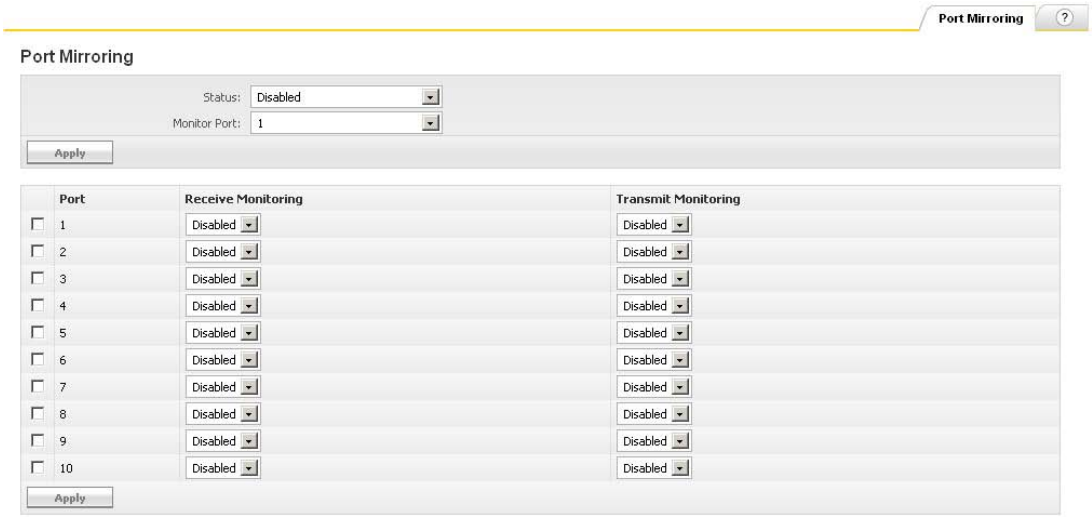


*Figure 52 The **Port Mirroring** section*

Status Select ***Enabled*** or ***Disabled*** to enable or disable port mirroring globally.

Note

Mirroring must first be activated globally; it can then be activated for the ports that you want to mirror. In this way, a maintenance configuration can be created and then activated or deactivated with this global switch.

Monitor Port Select the port that you would like to use as your diagnostic (monitor) port. Only one port can be selected. This port will receive the mirrored traffic.

Port Select the port that you would like to change by clicking on the checkbox here.

Receive Monitoring Select ***Enabled*** or ***Disabled*** to enable or disable receive monitoring for the corresponding port. If monitoring is enabled, then all incoming traffic will be mirrored to the specified monitor port. Port monitoring must be globally enabled for this change to take effect.

Transmit Monitoring Select ***Enabled*** or ***Disabled*** to enable or disable transmit monitoring for the corresponding port. If monitoring is enabled, then all outgoing traffic will be mirrored to the specified monitor port. Port monitoring must be globally enabled for this change to take effect.

15.2 Switch History

This section lists a system log of all significant switch events. The one-hundred most-recent events are listed in chronological order. This list is maintained until the switch is rebooted or until the user deletes the list using the *Clear* button.

Switch History
Switch History
Event No. | Event | Time | Date | SysUpTime
10 | Web login successfull | 22:17:15 | 01.01.00 | 22 hours, 17 minutes and 25 seconds.
9 | Web login successfull | 00:04:56 | 01.01.00 | 5 minutes and 7 seconds.
8 | Link status up on interface Fa0/6 | 00:00:04 | 01.01.00 | 15 seconds.
7 | Link status up on interface Fa0/1 | 00:00:04 | 01.01.00 | 15 seconds.
6 | Ip address has been changed | 00:00:03 | 01.01.00 | 14 seconds.
5 | Ip address has been changed | 00:00:03 | 01.01.00 | 14 seconds.
4 | Link status down on interface Fa0/6 | 00:00:03 | 01.01.00 | 14 seconds.
3 | Link status down on interface Fa0/1 | 00:00:02 | 01.01.00 | 14 seconds.
2 | Firmware: 2.1.1.1 (hw=MB-2 V1.0, d-tm=Nov 25 2009-10:36:48) | 00:00:10 | 01.01.00 | 0 seconds.
1 | SYSTEM IS STARTING... | 00:00:10 | 01.01.00 | 0 seconds.
Clear
Refresh

*Figure 53 The **Switch History** event list*

Event No. Switch events are numbered in decreasing order as they occur. The last 100 events are displayed.

Note

The counter starts with "1". New events will be inserted on the first line of the list, so that the oldest event (with the lowest number) will move downwards. If more than 100 events reported, the oldest events will be deleted on the bottom line of this list.

Event Displays a text message which describes the event which occurred.

Time / Date Displays the time and date that the event occurred in the format hours:minutes:seconds and day.month.year.

SysUp Time Displays the time elapsed from when the system was last powered on to when the event occurred.

Clear Click on this button to delete the listed sequence of events. Then click on the ***Switch History*** tab at the top of this section to refresh the view.

Refresh Click on this button to update the list with the most current events.

Event messages are described in the table below.

Event Message	Description
Switch History deleted	The switch history has been cleared.

Switch started in HARTING service mode IP address fixed to 192.168.0.5	The switch has been booted up in the special service mode and the IP address has been changed to the service mode IP.
SYSTEM IS STARTING	The switch is booting up.
The switch has detected low supply power	A low voltage level was detected on the switch power supply.
Configuration was saved	The configuration has been saved.
IP address has been changed	The IP address has been changed.
HTTP login successful	An HTTP login was successful.
Console login successful	A successful attempt was made to login to the console on the switch.
Console login failure	A failed attempt was made to connect to the switch console's command line interface.
Firmware update was initiated	An update of the firmware has begun.
Link status <up|down> on interface Fa0/ <port-number>	Displays when a physical device is connected or disconnected physically to a switch interface.
Admin status <up|down> on interface Fa0/ <port-number>	Displays when the admin status is changed for an interface. Not currently supported in firmware version 2.0.1.18.
Got time from <SNTP-server-ip-address> (a. <SNTP-server-index>)	The time was successfully fetched from an SNTP server.
Writing new <issNVRAM-file-name> with default values	Writing factory default settings to non-volatile random access memory (NVRAM). Not currently supported in firmware version 2.0.1.18.
Send email message: <message-text>	An e-mail message was successfully relayed to the SMTP server.
Send email failure: <error-text>	An error prevented the e-mail message from being sent.
Servicemode IP is <ip-address-of-switch> (<result-code>)	The IP address and result code for service mode is shown.
hTrap: <config-failure-info>	A HARTING-specific SNMP trap alarm function has had a configuration failure.
[PNE] ...	PROFINET Stack Manager

Table 1 Event messages

15.3 The MAC Address Table

*Figure 54 The **MAC Address** Table*

This section displays a table of MAC (Media Access Control) addresses for devices connected to the switch. The following information and functions are available:

All Ports	Select which ports you want to see listed in the table. If all ports are not listed, re-select ***All Ports*** and click on the ***Apply*** button.
Index	Displays the row or sequence number of the entry.
MAC	Displays the hardware-based MAC address for the device connected to the port.
Type	Displays whether the MAC address was learned automatically by the switch or if it was entered manually. ***Unlearned*** is displayed when the address has been manually specified.
Port	Displays the number of the port from which the MAC address was be learned.
Aging Time	Specify the ageing period (in minutes) after which the MAC address entry will be deleted from the table if it is no longer needed.
Clear Table	Click on this button to delete the current address/port assignments table. A new address/port table is created once again after you click to select ***All Ports*** at the top of this section. This feature allows you to quickly verify which devices have been replaced or added.
Refresh	Click on this button to update the information.

16. Service Mode

The service mode offers extended functionality for configuring network settings and user rights in the switch management software.

You may need to enter the service mode if the password for the ***Admin*** access level to the software is lost or the Ethernet Switch can no longer be addressed using its IP address. Booting into the service mode will reset the switch to its default settings.

This service mode is deactivated as the factory default setting. It is possible to enter the service mode by first enabling the Service Mode detection via SNMP and using a special bridged connector during switch startup.

Note

It is is using the Service Mode has to be enabled at first (see Switch Management - **General Settings**).

The instructions for the bridged connector follow below.

Figure 55 *Connecting the bridged plug to enable service mode: connect the wires as described in the instructions below*

4-wire Cable		8-wire Cable		
Signal	Colour	Signal	Colour	Pin
TX+	Yellow	T3	Green/White	1
TX-	Orange	R3	Green	2
RX+	White	T2	Yellow/White	3
RX-	Blue	R2	Yellow	6

Table 2 *Wire connecting for Service Mode plug*

Note

The switch can be reset to factory default settings without entering the service mode. Simply go to the **Systems Settings** → **File Transfer** section. Then select the ***Configuration*** tab and select the ***Reset to Factory Defaults*** option. Then click ***Apply***.

Entering service mode:

1. Construct a special bridged Ethernet plug. You can make such a plug by cutting through a standard eight-wire Ethernet patch cable. Connect the TX+ wire together with the RX+ wire. Then connect theTX- wire with the RX- wire.The other wires should be left disconnected.
2. Disconnect power to the switch. Insert this bridged plug into the last RJ45 port. For example:
   - Ha-VIS FTS 3100-A: port 10
   - Ha-VIS FTS 3060-A: port 6 etc

   Turn on the switch and wait a minute while it boots.
3. Take out the bridged plug and insert the cable from your administrative console into the last port.
4. You can now connect to the switch using the service mode IP address (***http://192.168.0.5***). Make sure that no other computer on your LAN uses this IP address.
5. Login to the switch using the ***admin*** account and the default password *harting*.
6. Change the switch IP address and the admin password as required.
7. Restart the switch. The switch will boot up with the new settings. If you do not specify a new IP address, the switch will be assigned its default IP address of ***192.168.0.126***.

Note

No data traffic takes place to the connected network when service work is being carried out in the service mode.

17. The SD-Memory Card (optional)

The FTS 3000 Switches offer the possibility to insert a SD - memory card (e.g. part number XXXXXX, optional) to store configurations (e.g. for maintenance purpose).

The slot to insert and eject the card is on the backside of the switch:

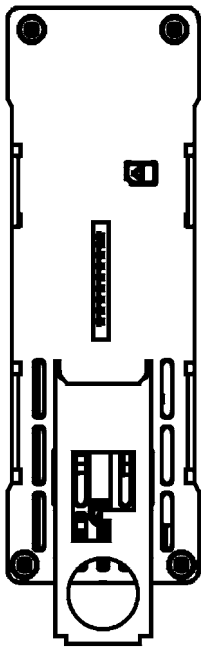


Figure 56 *Slot for SD card on the backside of the switch (figure may vary depending on type)*

Please push the metal holder to one side and insert the memory card until it is locked. Then push the metal holder back again.

To remove the memory card please open the metal holder again, then press the card to unlock it, then remove it

If the inserted memory card is empty, please insert it and then start-up the switch. The active configuration will be stored on the memory card when ***SAVE CONFIGURATION*** is pushed (see chapter **5.2**).

If the inserted memory card already contains a valid configuration, the switch will load this configuration directly from the SD card.

If no card is inserted the switch starts with the flash-memory configuration. If the switch is new this is the default configuration.

The card configuration will only be used during start-up process or by using the button for saving the configuration (***SAVE CONFIGURATION***, see chapter **5.2**).

Note

- It is only possible to use HARTING SD cards in the FTS switches.
- It is only possible to store one configuration on the memory card at the same time. This configuration has a special file name.

- If a valid SD-Memory-Card is inserted and the ***SAVE CONFIGURATION*** button is pressed, the configuration will be stored inside the flash memory of the Ethernet Switch as well as on the SD-Card
- To save a configuration on the SD Card it has to be unlocked.

Note

Plug in or remove the SD card only when the switch is turn off.

When SD card is plugged in the switch stores the configuration alsways at SD card and the internal flash.

18. Configuration with Automation Software Tool

The FTS Ethernet Switch supports the **PROFINET I/O** stack and can be projected via automation software tool. Following instructions refer to **Step7** as example for an automation software tool.

Settings via automation software tool and Web access:

Several settings like IP address can be made via Web access or via automation software tool. All new setting made via automation software tool overwrite old settings.

After reboot as PROFINET device all settings stored in the automation project will overwrite old settings.

For more information about PROFINET please look at the homepage of the PROFIBUS & PROFINET International under **http://www.profibus.com/**

For more information about **Step7** please look at the homepage of the Siemens AG under **http://www.siemens.com/**

18.1 Installing the Ethernet Switch as PROFINET device

As default setting the switch is no PROFINET device. For using it in a PROFINET network you have to enable PROFINET in the tab ***Industrial Profile***. After automatic reboot the switch can be projected via automation software tool.

Export the GSD file from the switch as in chapter "**Industrial Profile Section**" explained or download it from the HARTING homepage:
http://www.harting-connectivity-networks.de/service/download-software/

1. Open the ***Step7 Hardware Config*** and install the GSD file via ***Options***.

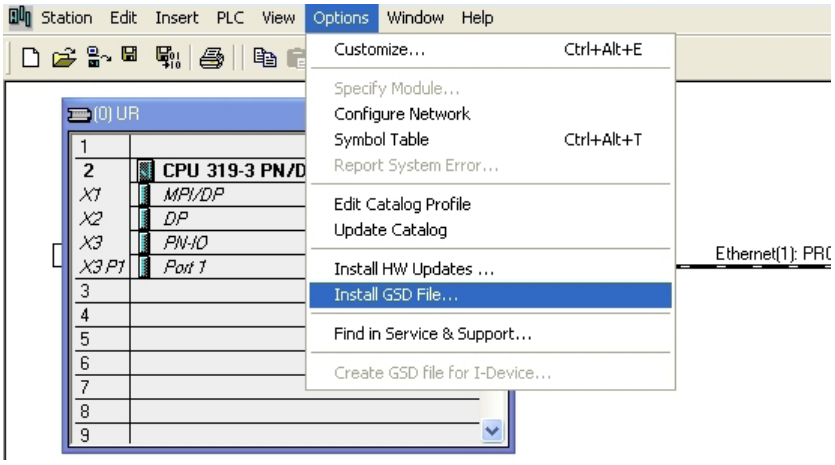


Figure 57 Installing the GSD file

Now the HARTING Ha-VIS Fast Track Ethernet Switch can be found in the library tree under ***Additional Field Devices → Switching Devices → HARTING Ha-VIS Switch***.

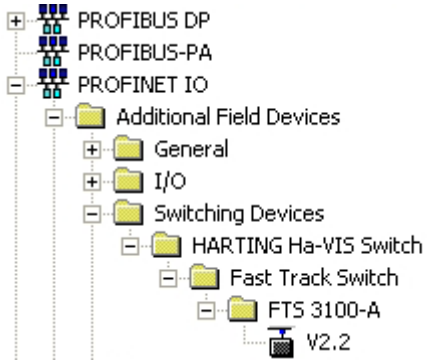


Figure 58 Products in the library

2. Drag and drop the switch onto the Ethernet bus line.
3. Double click on all devices, if you want to use them.
4. Double click on the FTS icon and give the FTS device a name under ***Device name***
5. Assign a device name under ***PLC → Ethernet → Assign Device Name***:

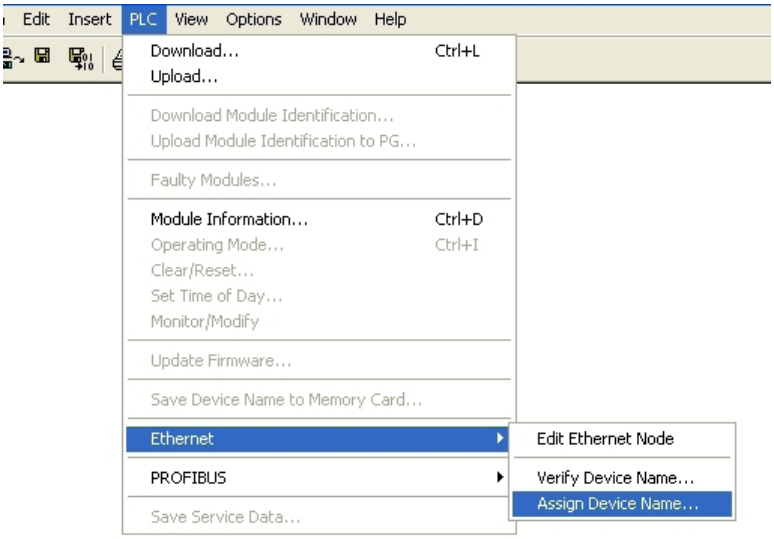


Figure 59 Assign a device name

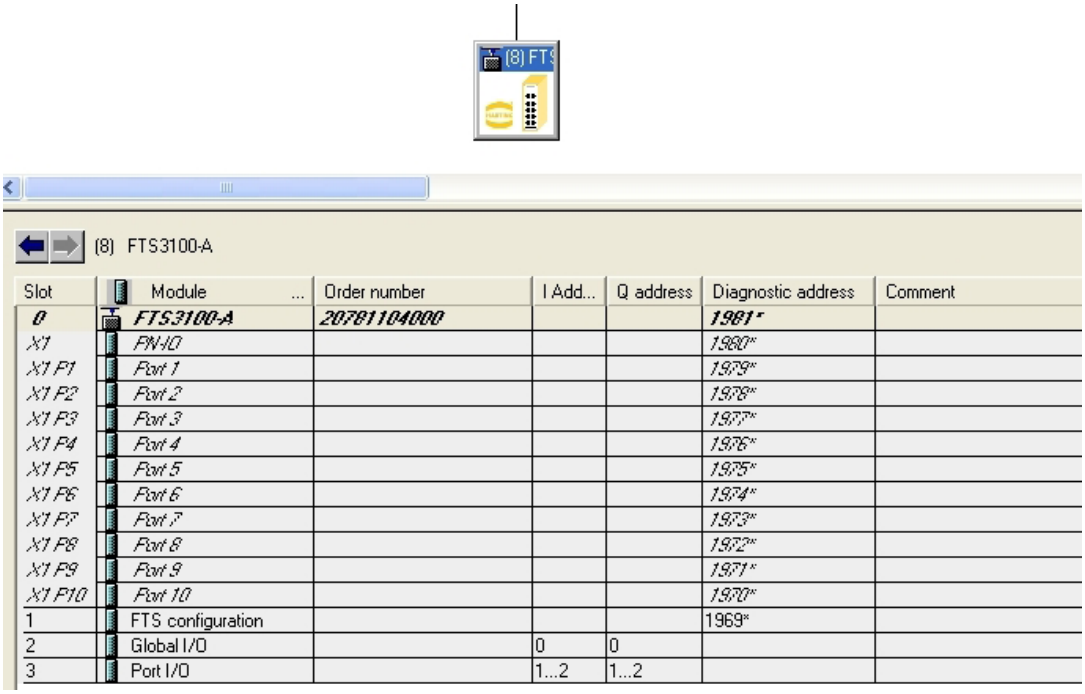


Figure 60 Slots and modules of the Ha-VIS FTS 3100-A

18.2 Alarms and Diagnostics

18.2.1 Slot 0: Ha-VIS FTS 3100-A

Double click at the line so the window ***Properties*** will be opened.

In the window ***General*** information about order number, hardware and software revision level, name and description of the device can be found.

In window ***Parameters*** general device alarms can be set:

- ***No SD Card in Slot***
  When activated the PLC will get an alarm in cases of an empty SD card slot in the back of the switch.
- ***Low Voltage detected (US1 or US2)***
  When activated the PLC will get an alarm in cases of low voltage (less than 9.6 V) at Power Supply 1 or Power Supply 2. It doesn't matter witch of the both has low voltage.
- ***Invalid Authorisation (Web-Frontend/Console)***
  When activated the PLC will get an alarm in cases of failed login via Web front-end or console.

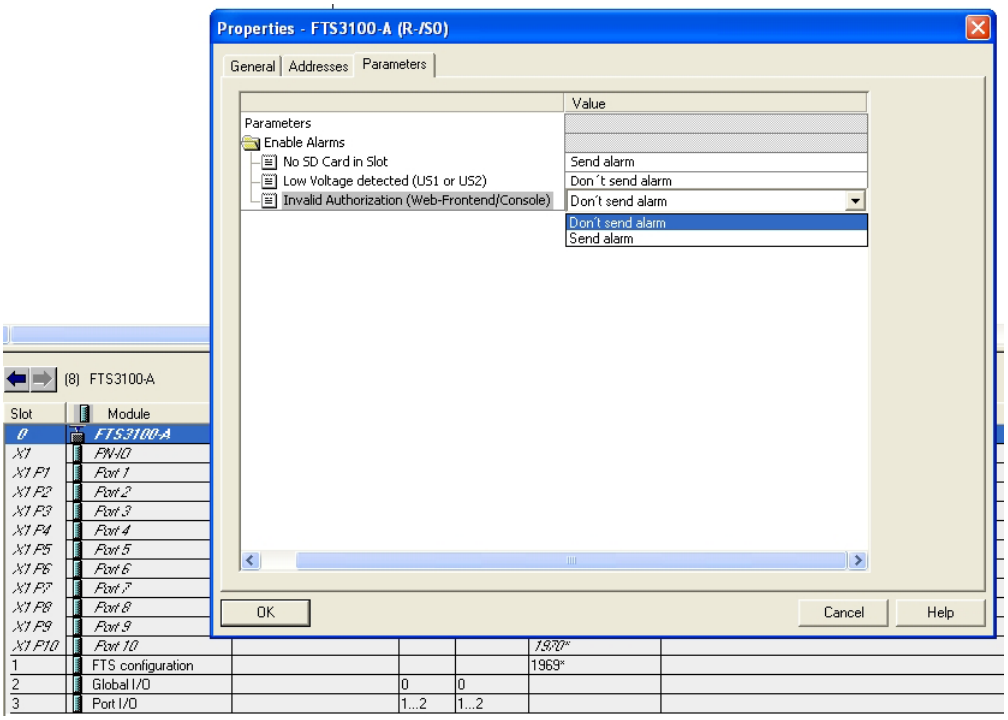


Figure 61 Alarms in Slot 0

18.2.2 Slot X1

Double click at the line so the window ***Properties*** will be opened.

In window ***General*** you can edit the name of the slot PN-I/O.

In window ***Addresses*** you can edit the address of that interfaces used for diagnostics.

In window ***I/O Cycle*** you can change the update time. The number of accepted update cycles with missing I/O data is set fix to **3**.

18.2.3 Slots X1 P1 to X1 P10

Double click at the line so the window ***Properties*** will be opened.

In window ***General*** you can edit the name of the port.

In window ***Addresses*** you can edit the address of that port used for diagnostics.

In window ***Topology*** you can interconnect devices.

In window ***Options*** you can make the settings for data rate and duplex mode. You can choose between

Turned off	select a desired state of the port (like admin state down)
Automatic settings	takes the current setting of the port (done e.g. via Web front-end)
Automatic settings (monitor)	takes the current setting of the port (done e.g. via Web front-end) and checks data rate and duplex mode of the connected partner port via LLD
TP / ITP 100 Mbps full duplex	Auto-negotiation with check if the transmission parameters are 100 Mbit/sec and duplex mode For fixing the data rate and mode ***Disable Auto-negotiation***

TP / ITP 10 Mbps half duplex	Auto-negotiation with check duplex mode if the transmission parameters are 10 Mbit/sec and half mode For fixing the data rate and mode ***Disable Auto-negotiation***

In window ***Parameters*** you can enable the sending of an alarm to the PLC when the operational link state goes down.

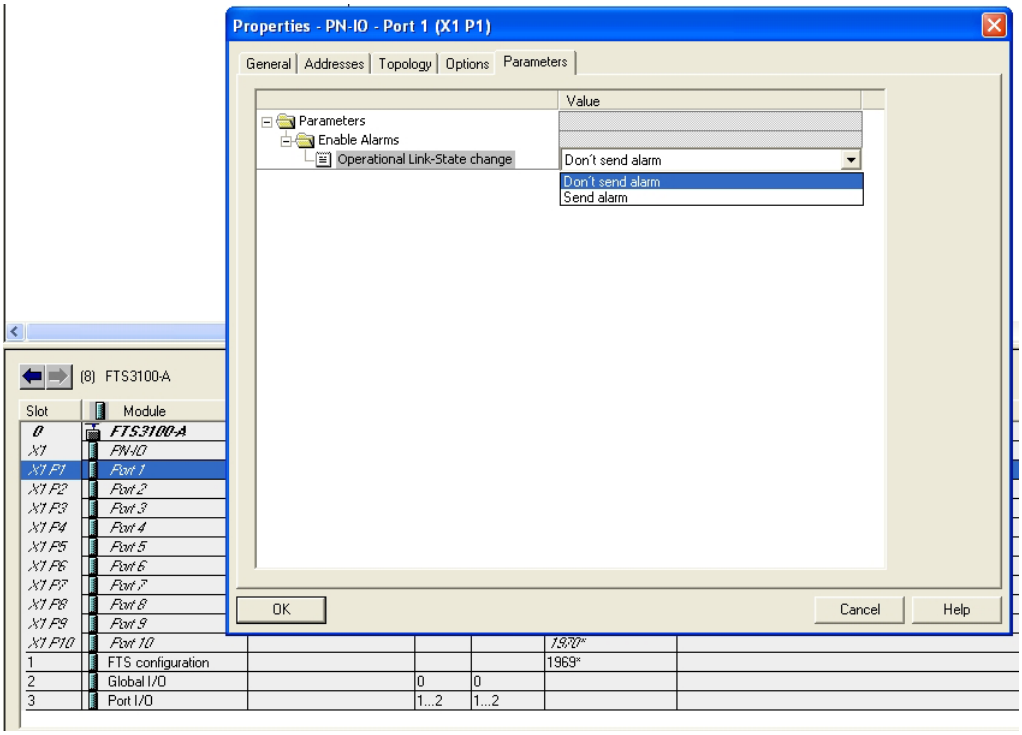


Figure 62 Parameters in slot X

18.2.4 Slot 1: FTS configuration

The slot ***FTS Management*** can be put optional into slot 1 to make FTS specific settings via automation software tool.

Double click at the line so the window ***Properties*** will be opened.

In window ***General*** information about hardware and software revision level, name and description of the device can be found.

In window ***Addresses*** you can edit the address of the device for diagnostics.

In window ***Parameters*** FTS specific settings and realtime settings can be made:
You can activate (***ON***), deactivate (***OFF***) the functionalities or leave the settings in current state (e. g. done via Web front-end)

Fast Track Switching	Activates FTS mode for identifying, acceleration and overtaking RT traffic
NRT Traffic Control	Activates ***NRT Traffic Control*** with level 1
FTS-RT-profile: PROFINET	Activates PROFINET as identifier for acceleration

FTS-RT-profile: Ethernet/IP	Activates EtherNet/IP as identifier for acceleration No other settings needed for EtherNet/IP like IGMP will automatically be activated. To enable these functionalities please change them via Web front-end.
FTS-RT-profile: Modbus TCP	Activates Modbus TCP as identifier for acceleration

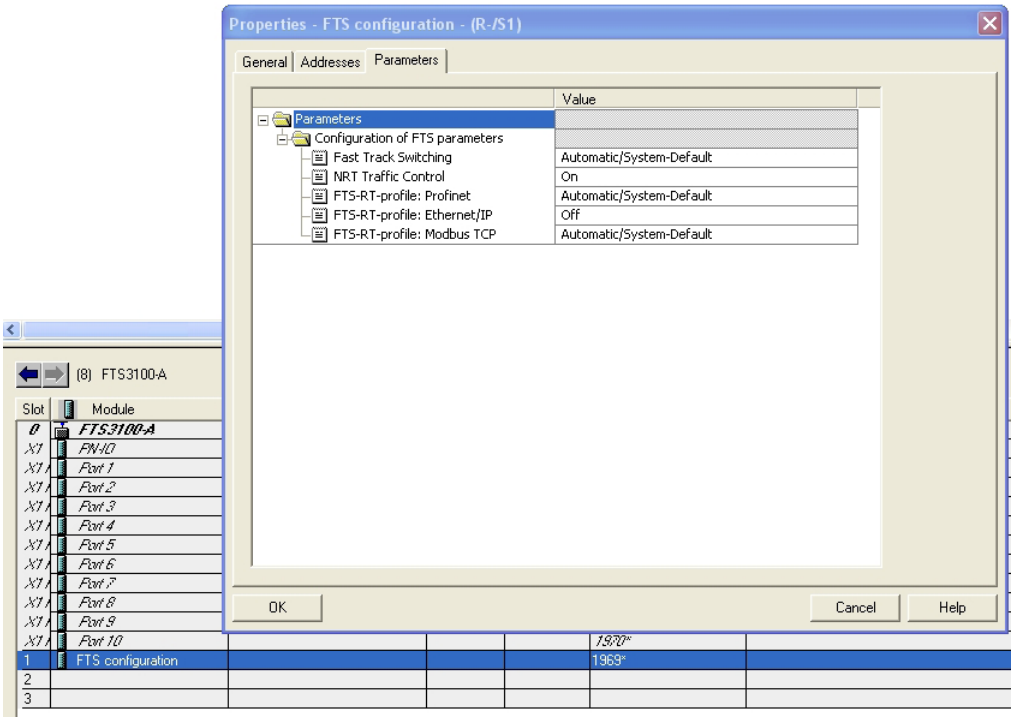


Figure 63 Parameters in slot 1: FTS configuration

18.2.5 Slot 2: Global I/O

The slot ***Global I/O*** can be put optional into slot 2 to make settings for global device I/O data.

Double click at the line so the window ***Properties*** will be opened.

In window ***General*** information about ***Hardware*** and ***Software*** revision level, ***Name*** and description of the device can be found.

In window ***Addresses*** you can edit the I/O addresses.

One byte output data is reserved and currently not used.

One byte for global input data is reserved with the following meaning:

Bit	Value	Meaning	Value	Meaning
0	0	SD card in put in	1	SD card is not put in
1	0	Voltage in valid range	1	Low voltage detected (US1 or US2)
2	0	No change in configuration	1	Change in configuration (Web front-end or console)
3	0		1	Invalid autorisation (Web front-end or console)

4	0	FTS disable	1	FTS enable
5	0	NRT disable	1	NRT enable
6	0	-	1	-
7	0	-	1	-

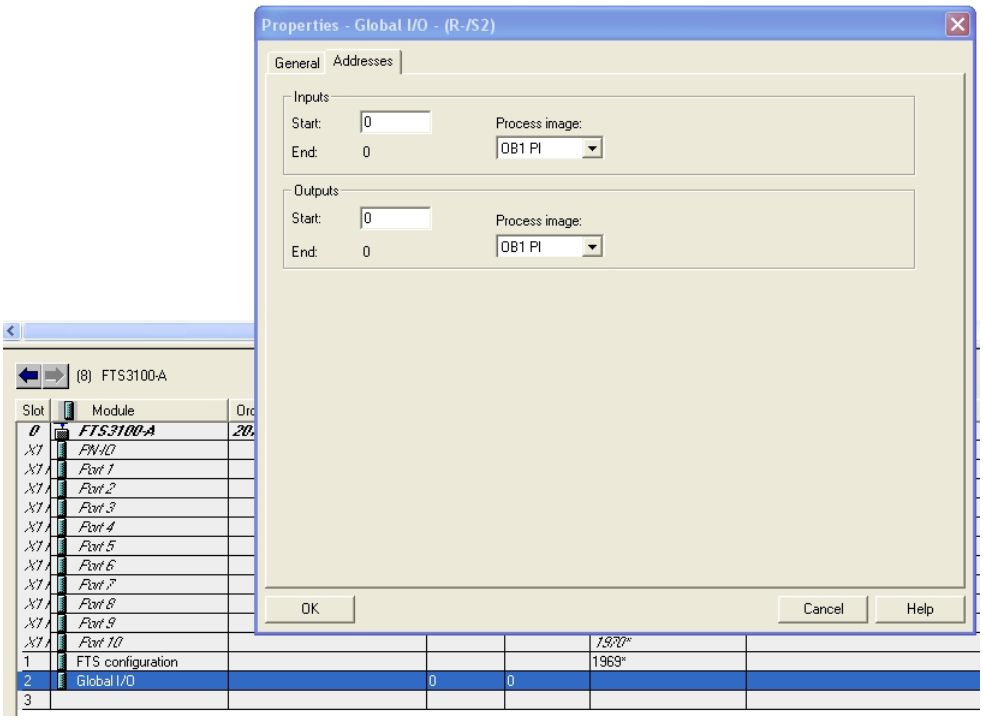


Figure 64 Adresses in slot 2: Global I/O

18.2.6 Slot 3: Port I/O

The slot ***Port I/O*** can be put optional into slot 3 to make settings for port specific I/O data.

Double click at the line so the window ***Properties*** will be opened.

In window ***General*** information about hardware and software revision level, name and description of the device can be found.

In window ***Addresses*** you can edit the I/O address.

Two bytes output data is reserved and currently not used.

Two input bytes are reserved for Link state of the ports (1 means ***UP*** and 0 means ***DOWN***)

Byte 1

7	6	5	4	3	2	1	0
port 8	port 7	port 6	port 5	port 4	port 3	port 2	port 1

Byte 2

7	6	5	4	3	2	1	0
-	-	-	-	-	-	port 10	port 9

Appendix

Glossary of Terms and Abbreviations

Ageing	The dating process which the Ethernet Switch uses to keep track of how old certain data is. Entries in the MAC address table, for example, are deleted after they pass a certain age.
Auto-negotiation	An Ethernet mechanism which allows 10/100 Mbit/s or 10/100/1000 Mbit/s Ethernet ports to automatically establish the optimal duplex mode, flow control and speed.
Boot	The process of starting up a device and loading the operating system.
Browser	An application program running on a client PC which allows the user to view and interact with web pages on the switch or anywhere on the Internet.
Collision	The event when two packets in an Ethernet network collide. A minimal number of collisions are typical on Ethernet. A sudden prolonged increase in the number of collisions, however, may indicate that a device is experiencing a problem.
Community	A SNMP group, minimally consisting of a manager and an agent. Access to the group is limited by a community string.
Cost	A factor used when calculating path transmission speeds. The cost of a port or path is assigned based on its desirability, with desirable (faster) paths being assigned lower costs.
DHCP (Dynamic Host Configuration Protocol)	A method for dynamically assigning IP addresses on a network. Dynamic addressing simplifies the administration of a network because the DHCP software (and not the network administrator himself) is responsible for tracking the IP address allocation. Typically, a DHCP server can be used on a LAN to “lease” an IP address to a new device for a limited amount of time. The Ha-VIS mCon Ethernet Switch is configured to accept this address when IP Address Mode is set to ***Dynamic***.
Ethernet	An IEEE standard networking protocol. The protocol describes a frame-based technology for sending out and receiving from a transmission media.
Export	The process of transferring (uploading) a saved configuration or firmware file from the Ethernet Switch to a TFTP server.
Fast Ethernet	An Ethernet network capable of operating at 100 Mbit/s.
Firmware	The programming code used by the switch for its basic operating functions. The Ethernet Switch firmware operating system can be upgraded by overwriting it with a new firmware version.
Flow Control	A mechanism that allows high speed devices to communicate with lower speed devices. The rate of data transmission is limited when the fast sender slows down to prevent a slow receiver from being overrun with data.
Full Duplex	The ability of a network connection to handle communication in both directions simultaneously.
Gigabit Ethernet	An Ethernet network capable of operating at 1000 Mbit/s (1 Gbit/s).

Half Duplex	A network connection that is not capable of communications in both directions simultaneously. Communication in both directions is possible, but each device must wait for the other to stop transmitting before replying.
HTTP (HyperText Transport Protocol)	A communication protocol used between a web browser and web server. HTTP is used throughout the world wide web and is also used between the client web browser and the web server on the Ethernet Switch.
IEEE (Institute for Electrical and Electronics Engineers)	An American organization created in 1963 that has been responsible for setting standards for communications.
IGMP (Internet Group Management Protocol)	A protocol used to manage the membership within IP multicast groups. It enables hosts to notify a local router or switch and inform them that they would like to receive transmissions assigned to a specific multicast group.
IGMP Snooping	A method where a switch listens ("snoops") in on IGMP messages so that it can optimize the traffic flow. IGMP snooping is able to limit bandwidth-intensive traffic (such as streaming video) to only the specific requestors. Flooding of the entire network is then avoided.
Import	The process of transferring (downloading) a configuration or firmware file from a TFTP server to the Ethernet Switch.
IP (Internet Protocol)	The broad-based protocol used in the Internet layer of the Internet protocol suite. The IP protocol defines addressing and data packet formats.
IP Address	A numeric address used to identify a computer or device on a network. The Ethernet Switch has a default IP address of ***192.168.0.126*** set at the factory. A new, unique IP address should be assigned to fit the user LAN.
LAN (Local Area Network)	The group of computers and devices that populate your local network. The address range of a LAN can be defined by the subnet mask.
Link Aggregation	A trunking strategy which optimizes available resources by linking a group of ports together to form a single trunk.
MAC (Media Access Control) Address	The unique, physical address assigned to a device by the manufacturer. The switch maintains a MAC address table of connected devices. These addresses are used for sending layer-two Ethernet frames to a specific host.
Managed Switch	An intelligent device which filters and forwards packets between network segments. A managed switch features one or more ways for the user to directly access and configure switch operations (such as a web or command-line interface).
MIB (Management Information Base)	A database used by SNMP to describe and manage devices within a network.
Mirroring	A process where data flow from or to a particular port is duplicated and sent to another port for monitoring purposes.

Multicast	A method of network addressing used to deliver information to a group of targets simultaneously. Multicast addressing attempts to implement the most efficient strategy possible for delivery and creates copies of data streams only when links to multiple destinations split apart.
Packet	A discrete unit of data sent out over a network.
Port	A connection jack on a switch or device which is used for plugging in connections to other devices.
Port Mirroring	A network monitoring method where a copy of all incoming or outgoing port traffic is forwarded from one switch port to another. The duplicated traffic flow can then be analyzed at the forwarded port. The network administrator may use a protocol analyzer which captures and evaluates the data flow without influencing the client on the original port.
QoS (Quality of Service)	A control mechanism or strategy for achieving a higher quality of service. The strategy used on the Ethernet Switch assigns different priority to packets from different ports. Thus, certain critical ports on the switch can be given priority over others. This can help assure better transmissions for those ports during network congestion.
Redundancy	A strategy used by the switch to provide back-up paths in the event that an active link fails. The back-up link guarantees that data transmission can continue even when the primary link goes down. RSTP is used to create a redundant network topology.
Relay	An electrical circuit that can be open or closed. The mCon Ethernet Switch uses a relay port to send out electrical signals based on the configuration in the Alarm -> Relay Alert section.
RFC (Request For Comment)	A formalized publication of the Internet Engineering Task Force describing a certain protocol or method used in Internet-base communications. RFCs can be downloaded from http://tools.ietf.org/html/.
RSTP (Rapid Spanning Tree Protocol)	A layer-two protocol that creates a spanning tree topology within a network of inter-connected bridges (such as the Ethernet Switch). RSTP disables links that are not part of this spanning tree, thus creating a single loop-free path between any two network nodes.
SMTP (Simple Mail Transfer Protocol)	The standard Internet e-mail transmission protocol. A relay SMTP server should be specified on an e-mail client (such as the Ethernet Switch) to enable it to send outgoing e-mails.
SNMP (Simple Network Management Protocol)	A network management system used to monitor attached devices (such as the Ethernet Switch). Managed devices collect state information about themselves and make this information available to centralized network-management systems. The Ethernet Switch maintains status information in its MIB which can be accessed by a separate SNMP management workstation.
SNMP V1	An earlier version of SNMP where security is based only on private community strings.
SNMP V3	The current version of SNMP with support for authentication, access control and privacy.

Subnet	A group of networked computers that all share a common IP address prefix. All devices within the same IP subnet can be reached in one hop without a router.
Subnet mask	The IP decimal representation for the subnet prefix of the IP address. The subnet mask specifies the length of the shared subnet prefix as used by all devices in the local subnet. A subnet mask of ***255.255.255.255*** is used by the Ethernet Switch to isolate a specific IP address.
Switch	A device that connects several LANs together to form one logical LAN. A switch is similar to a bridge, but usually offers more sophisticated features for bridging LANs of different types.
TFTP (Trivial File Transfer Protocol)	A simplified version of the TCP/IP file transfer protocol used by the switch to transfer saved configuration profiles and to perform new firmware updates. The switch can download new firmware from a customer's TFTP server. A username and password are not required by the TFTP protocol.
VLAN (Virtual Local Area Network)	A logical subgroup which acts like a LAN and communicates as if attached to one broadcast domain.

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Subject to alterations without notice

Ha-VIS FTS 3000 Management Software Manual

Part number: 20 78 110 4xxx/99

Status: 2011-07 / English

Printed in Germany

Pushing Performance

www.HARTING.com